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ARE FORESTERS BIOLOGISTS OR ECONOMISTS?

EDITORIAL.

In the training of foresters, much stress has been laid lately on the physical and biological sciences. Some forest schools take pride in the emphasis that is laid in their curricula upon physics, chemistry, zoölogy, and botany. Any curriculum taken at random shows the preponderance of physical and biological sciences as the basis of the average forester's training, and the almost entire absence of preparation in economics. The recent development of Forest Experiment Stations and the demand for men especially trained in the exact sciences has given impetus to this emphasis.

Yet, if one would stop and analyze the activities of the average forester in actual life, the knowledge which comes most into play is in the field of economics. Take the Supervisor of a National Forest. The problems that confront him, for example, such expenditure of money as will secure the greatest economic benefits to the community, the economic importance of the timber resources of his Forest to the wood-using industries of the region, problems of appraisal, selling and marketing, are all of economic nature.

The work of a private forester with a company or in a consulting capacity at the present stage of forestry development, is almost exclusively economic in character. Whether it is the financial reorganization of the company's investments from a "cut out and get out" policy to a sustained yield basis, whether the application of this or that method of cutting as it relates to present returns or future investments, whether it is a problem of forest taxation, advisability of retaining or abandoning cut-over lands—all are problems which call for a high degree of economic training and sound economic judgment.

The State forester, when he plans his fire protection, must think in economic terms, of labor and equipment outlay, material and money damages, and the relation between cost of prevention and suppression and the values involved.

As a guess, 75 per cent of the knowledge needed to solve the day's problems of the average forester is in the realm of economics. Even in the forest schools of Germany, where one would expect that biological training would be emphasized to the exclusion of all others, students must spend, out of a total of 4 years, 2 semesters or 1 year either in the University of Berlin or Munich, in the study of jurisprudence and political economy. They must pass a special examination in these subjects before they are allowed to complete their training.

This is not a plea for economic training to the detriment of the exact sciences, but for a balanced training, which would give the student better preparation to face the realities of life.

The difficulty is the same that is encountered in many other important subjects, namely the lack of qualified teachers. There are almost no economists in this country who have made forestry a specialty. There are gradually emerging agricultural economists, tax economists, and other brands of economists, but few forest economists. Yet the ills besetting our lumber and forest industries are economic: the over-production, the marketing, financing, investments in raw material, export, and import, and relationships with other industries.

Foresters might be benefitted even in specialized forestry fields by study of economics. The statistical method originated and found its highest development in economic investigations and now finds almost constant application in biology and forestry. We are not trained economists, and yet, unfortunately that is the trade we have to ply. Is it not time that the forest schools should make an effort to fill the gap?

THE EVALUATION OF LOSS FROM KILLING DISEASES IN THE YOUNG FOREST

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INTRODUCTION

In a former paper¹ the need has been emphasized of a general classification of forest tree diseases on the basis of their relative importance. Of the numberless diseases known and described the great majority does not actually injure the host. Fungi with a low degree of parasitism, for example, causing a few small leaf spots on physiologically declining foliage do not affect the life and vigor of the plant as a whole. The damaging capacity of the more aggressive fungi ranges from the mere nuisance of a slow drain on the host to the serious menace of quick and devastating killing.

Any rational system of rating these diseases must be based upon the type and extent of the damage they are able and likely to cause. It becomes necessary to find a definite and clear mode of expression for this damage.

Broadly, the diseases of forest trees can be grouped in two large classes, those which destroy or deteriorate the accumulated wood and those which affect the formation of the wood itself. That the former, in particular those caused by the heartwood-destroying fungi, have held the attention of the forester and the pathologist alike at the expense of the latter is readily understood in a country where the wood supply seemed to be inexhaustible and where until recently little thought has been given to its replacement. The diseases affecting the foliage, living bark, cambium and roots have, consequently, interested the forest mycologist more than the forest pathologist, until the almost contemporaneous invasion of American forests by two scourges of the

¹ Meinecke, E. P. Basic Problems in Forest Pathology. In JOURNAL OF FORESTRY, v. 15, p. 215-224, No. 2, Feb., 1917.

most portentous nature, the white pine blister rust and the chestnut blight, brought forth a flood of investigations, dealing largely with the life history of the two fungi concerned and with questions of control, but only beginning to touch upon the profound changes in the character of the invaded stand which result from the sudden dropping out of an integral species. The spectacular history in the United States and Canada of fungi foreign to this country has somewhat obscured the fact that our American forests harbor a number of endemic killing diseases which might well play a similar rôle if introduced into other countries and which are far from negligible in our own. They are fairly well known from the mycological standpoint, but their pathology and, in particular, their actual influence on the life and future of the stand has been the object of few and desultory speculations.

The term "killing diseases" needs qualification. In the strictest sense there are no diseases known which invariably make a clean sweep of all trees. Even the chestnut blight and the white pine blister rust do not always directly kill their hosts. Often only branches or twigs are infected and with the dying twig the fungus itself dies off without reaching the main stem. As long as only a small number of twigs on a tree are killed the injury may be slight. The larger the number the closer will the collective injury approach the danger line, and in extremer cases the death of many individual twigs conditions the death of the tree. An attack on the bole readily leads to death.

Among the killing diseases there are not a few which, within their sphere, compare in destructiveness with minor attacks by the white pine blister rust. The main difference is that epidemiologically they have become stabilized. They do not spread from the range which they have conquered. A state of equilibrium has developed between parasite and host population which is rarely disturbed, but the process leading to this equilibrium not infrequently culminates in the subjugation of the host, a relationship in which the parasitic organism makes such heavy demands upon the host that the latter is barely capable of carrying on its most essential life functions. The mistletoes of the genus *Razoumofskya* illustrate what can happen to a host species for which, over whole regions, the equilibrium has established itself in favor of the damaging factor.

The number of fungi actually causing damage through killing is considerable though the degree of damage varies greatly. Hardly an attempt has been made to gauge the destructiveness of even the more

prominent of these. They are known and described when they appear to damage some valuable host species. Far more destructive fungi ravaging the less desirable and inferior members of the forest association are neglected. It is evident that, subconsciously, the economic value of the host is made the criterion as to whether a specific disease justifies special study or not. But what is often overlooked is the inevitable shift in economic values. In the ratio in which the high grade timber is cut out the lower grade species must come to the fore, and with this change the diseases attacking them must receive a greater share of attention.

The damage caused to forest trees by diseases can be expressed either by the degree of injury to the individual or by the degree of injury to the stand and the forest. The former is of interest to the pathologist but as such has no bearing on loss. As an individual the forest tree has no value, hence its death does not necessarily constitute loss. Loss can have only one meaning in forestry, that of economic loss, which in turn is practically synonymous with loss in wood production. It can, then, only apply to productive units, that is the stand and, ultimately the forest. Every isolated individual produces wood but neither in the quantity per unit of area nor in the quality which make the growing of forests economically advantageous. Only when individuals congregate in organic union can one speak of a productive stand or forest.

The loss accruing to the young forest from killing diseases has rarely been considered. In a few instances an attempt has been made to express the loss in figures, generally by giving the percentage of individuals infected or killed. This approach can be of value only in the case of plantations where every tree supposedly stands in exactly the right position with regard to its neighbors and where the dropping out of individuals leaves the unit in an impaired condition or else as a means of conveying a very rough impression of the virulence of an attack. It is evident that a killing of 80 or 100 per cent of all the trees is equivalent to destruction of the stand, but the lower the percentage the less does the figure permit an appraisal of the damage.

The productiveness of the trees in a stand on a given site is largely a function of arrangement in space or density. In the wild stand all degrees of density are found, from almost bare spots with isolated individuals to badly overcrowded groups, both of which extremes are least conducive to the quantitatively and qualitatively de-

sirable production of wood. A method which attempts to present the loss in per cents of trees killed fails to take into account the mutual relationship of the components of the stand. It assumes that all trees are on a par with regard to productiveness and attributes an immediate value to a growing stock possessing in reality only a speculative value. The criterion by which the loss must be gauged is not the actual number of per cent of trees killed but the effect of the killing on the condition promising the best obtainable wood production. The loss, therefore, concerns not the present but the future value. It affects the expectation value of the stand.

The productiveness of the stand of a given density varies with each species, with age and site, with forest type and prospective utilization, and any endeavor to express loss in definite terms or figures must consider each factor in its relation to production. As soon as an attempt is made to analyze any one of these factors in the light of its relations to the rest the vagueness and uncertainty of definitions and the lack of fundamental data becomes apparent. It would be futile to evolve a formula for the evaluation of loss which would mostly consist of unknowns.

The general problem is so complex that the only hope of a successful attack lies in deliberately eliminating as many factors as possible and in concentrating upon the simplest possible set of conditions. The present investigation concerns only the pure stand. The factor of possible replacement by other species does not enter into the equation. One disease only is present. Site, type and prospective utilization vary within such narrow limits that they can be considered uniform. The main object consists in developing basic principles and evolving methods of approach. Its limitations are clearly understood. The specific fungus studied serves merely as an example. The methods used are subject to change. They represent not more than the first blazing of a trail in a hitherto impenetrable tangle.

FIELD INVESTIGATIONS

Among the heteroecious forest tree rusts endemic in California which have been known to be injurious to young growth *Cronartium pyriforme* (Peck) Hedgc. & Long alternates between *Pinus ponderosa* and *Comandra umbellata*. The fungus which has been reported from many places over the United States has so far been found in this State only in Northern and Central California. It seems to attack

only younger trees from seedling to sapling and pole size. While many similar rusts are generally found in profusion almost anywhere where their alternate hosts grow side by side, *Cronartium pyrifforme* is curiously localized in its occurrence within the Western yellow pine-Comandra association. In the Sierra Nevada in California, for instance, the fungus is not at all uncommon in the Northern part and appears again as far south as the Yosemite Valley, while not many miles north of the Valley, at Crocker's Station, *Comandra umbellata* grows thickly under Western yellow pine reproduction without either showing a trace of the rust.

The fungus occasionally occurs isolated in small patches of 20 to 40 feet square and then again over square miles. This latter condition is found, for instance, on the lava and ash-covered plateau north of Mount Lassen in the northern extension of the Sierra Nevada. From the Sacramento Valley a fairly steep slope rises to the East to a pass about 5,000 feet high leading to a large plateau or high valley of an average altitude of 4,000 feet from which here and there steep and high volcanic cones stand out. The West slope of the pass is covered with a mixed stand of the general type of the West slope of the Sierra Nevada and in which Western yellow pine, Douglas fir, White fir and Incense cedar predominate over the more scattered Sugar pine. The plateau itself is covered almost altogether with Western yellow pine. On lava rims Juniper appears and the volcanic cones bear a dense growth of the species mentioned above alternating with large sweeps of brush. Much of the plateau has been cut over in the past and Yellow pine reproduction has sprung up lightly mixed with *Quercus californica* of mediocre form and size. In general the site quality is poor. Growth is slow, and the distribution of the yellow pine individuals is uneven, varying from occasional very dense groups to almost denuded patches.

Even at first glance it becomes apparent that the damage from *Cronartium pyrifforme* is heavy. Everywhere dead trees stand among the living, many of which bear cankers in all stages of development. The general aspect reminds one of a fairly intensive attack by the White pine blister rust. Since Yellow pine is the only timber species present and without doubt will be the only constituent of the future forest the heavy killing by the rust increases the handicap under which the young stands are struggling on the many square miles of dry and unproductive highland.

The fact that there is loss can be taken in at once, but what this loss amounts to and whether it would justify, for instance, special methods of control or changes in principles of management is not immediately apparent. From the point of view of timber production it is of less importance to realize that the total original number of trees is no longer present than to gauge the chances the remaining stand has for growing up into a productive forest. The disease does not often take all individuals, except on small areas. Generally it is fairly evenly distributed, leaving sound trees in its wake, so that the thinning effected may prove beneficial in overstocked stands or fatal to stands of lesser density.

It was in this region that, in the summer of 1923, an investigation of the loss factor was initiated. Six plots were laid out, varying in surface from $\frac{1}{10}$ to $\frac{2}{5}$ of an acre. Two of the plots are located on the Western approach to the pass at an elevation of about 2,800 feet on fairly good sites in the mixed forest. The trees of each of these two plots are even-aged, 14 to 15 years old on one and 18 to 20 years old on the other. The weighted average heights are 13.5 and 17.8 feet, respectively. The other four plots are characteristic for the plateau type of pure yellow pine reproduction on dry and poor sites. They are located on the plateau east of the pass. Here the heights average from 3.7 to 15.2 feet. As is to be expected on the poor site the trees are relatively older than on plots on the west side.

The height of each tree was measured and notes were taken on infections. The trees were divided in four classes, sound, slightly infected, fatally infected and killed. Infections of the outer parts of the branches were considered slight. The mycelium of *Cronartium pyriforme* grows only very slowly and does not advance much beyond the original point of entry. Its effect on the invaded host tissues is deadly so that with the killed twig the mycelium itself dies off. On the other hand, all infections located on the main stem or on branches so close to the main stem that the mycelium in all probability will grow over into it were classed as fatal. With regard to the ultimate outcome the four classes logically combine to two groups. In the first, composed of sound and slightly infected trees, there is no loss in the sense here discussed. In the second the result is invariably the elimination of the individuals from the stand.

Two difficulties stand in the way of a clean-cut determination of loss from *Cronartium pyriforme* or any similar disease. One of these

has its root in the permanency of endemic diseases. Year after year, with slight variations in intensity a new wave of infections strikes the susceptible species. Consequently, a study of the loss suffered can give no more than the status at the time it was undertaken unless it is followed up by a series of investigations at more or less regular intervals. In the case of *Cronartium pyriforme* the complication induced by annual recurrence is less of a hindrance. Often the infections on Comandra are so heavy that this host is temporarily almost eliminated. As far as is known æcial infection directly from pine to pine cannot take place. The author, in a long series of experiments, has never been able to produce direct infection as in *Cronartium quercuum* and *Cronartium harknessii*. Thus the infection of the stand sweeps along in waves lasting a number of years and ending with the dying down of the Comandra population. Scattered individuals of the latter are held in check as long as the cankers on the pines continue to sporulate. As the affected parts of the pines die off under the action of the virulent rust Comandra again has a chance for re-establishment, and beginning from scattered over-holders the infection can gather strength for a new wave. In the region investigated the Comandra population had reached low ebb, partly, without doubt, due to killing out by the rust, partly also through destructive grazing by sheep. At any rate Comandra was sparingly represented and no new infections on the pines seemed to be present. The region offered, therefore, ideal conditions for a clean-cut study. That Comandra ultimately would come into its own again and that with its recovery a new infection would become possible lies beyond doubt. As to the duration of this development even a guess would be hazardous except to the extent that it must last a number of years or perhaps a period which may bring many of the trees now in the stand beyond the danger line. Pine seedlings springing up during or prior to the expected wave will be exposed to infection. On the other hand it is not likely that, in view of the scarcity of seed trees, many new seedlings will appear until the present stand has reached sexual maturity.

The other difficulty springs from the uncertainty of what constitutes adequate stocking for natural yellow pine reproduction of given sizes for different sites. The U. S. Forest Service has adopted, on an empirical basis and for purely practical purposes, the following numerical scale for Western yellow pine up to six feet in height. Stocking is considered good when the stand shows 1,500 or more

seedlings to the acre. It is fair with 1,000 to 1,500 seedlings and poor with 500 to 1,000 seedlings to the acre. Below 500 seedlings per acre the area is disregarded as far as reproduction is concerned. This scale is inapplicable for trees above six feet in height and furthermore does not express any degree of overstocking such as has to be taken into account in the determination of profit or loss caused by the rust. It concerns itself only with the present status without attempting to foreshadow the downward trend of degree of density when the stands have reached the heights of 12, 20 or 30 feet, that is the range of heights through which the rust continues to take a heavy toll. It goes without saying that the scale, adopted as it was for the practical purposes of extensive rather than intensive surveys, does not apply equally to poor sites as it does to the better ones.

On the first two plots in the plateau type the Forest Service standard was employed. On Plot 1 reproduction was dense and small. Counts were taken on one-tenth of an acre divided into 64 quadrats. The plot had 434 seedlings of an average height of 3.7 feet, or 4,340 to the acre. 65 per cent or two-thirds of the trees were dead or fatally infected. At first glance the loss appears appalling, but when the damage is expressed on the basis of quadrats reduced from adequate stocking to a poorly stocked condition as measured by the Forest Service scale the loss amounts to only 32 per cent. The weakness of the first method lies in the fact that the reproduction is never evenly distributed. In places it is heavily crowded, in others it is much below the desirable density. In this particular case 11 out of 64 quadrats were poorly stocked from the beginning. It follows that the method of expressing the loss in per cents of trees killed cannot give an adequate picture of the course and effect of the disease. The quadrat method undoubtedly comes closer to an acceptable interpretation. It is open to the objection that density on any one quadrat cannot logically be gauged without regard to the neighboring quadrats. The surfact of one quadrat is too small in comparison with the units of area over which a given density prevails.

Plot 2, also comprising one-tenth acre, had 180 trees. The average height was 15.2 feet, that is so far above the six foot limit of the Forest Service density scale that the latter becomes inapplicable. The fatalities were 21 per cent or one-fifth of the trees. A density of 1,800 to the acre may be considered rather high for trees of this class, provided the trees are evenly spaced. In reality about one-third of the

plot before the killing was almost void of reproduction while the rest was heavily overstocked. On this part the loss of one-fifth of the trees effected a wholesome and beneficial thinning which, in fact, could have gone a good deal farther without producing detrimental results.

It soon became apparent that the empirical scale based on numbers of trees per acre could not lead to a clear understanding of the effect of the killing on the stand and its future and that the problem had to be attacked from a different angle.

At the present time it seems fairly impossible to set up, for any height, diameter or age class of reproduction, even on a well defined site, a scale of density which expresses not only the existing space relations but also takes into account the changes to be expected within 10, 20 or 30 years, or as far in advance as it may be prudent to look ahead. Without some kind of workable scale, on the other hand, the evaluation of the effect of any biotic factor on the young stand becomes illusory. It became necessary, therefore, to adopt a standard by which density relations could be measured without losing sight of developments during the next few decades.

This is not the place to discuss at length the scientific and practical bases which could serve for the preparation of density scales. Suffice it to say that for the rest of the study, covering plots 3 to 6, the crown-spread of the tree was considered the most influential factor and its diameter was taken as one-half the height of the tree. No claim is made that the standard adopted has any special merit except to serve the immediate purposes at hand which aimed to illustrate by the simplest means the change brought about by the rust. For most trees within the height classes up to 30 feet the standard cannot be far from being acceptable. It is evidently most debatable for the smallest, and again for the tallest trees. For the first the ratio of diameter to height is too small, and for the second it is too high, but in neither case is the accepted ratio so far off the probable truth as to introduce a serious error. Recent check measurements have amply confirmed the usefulness of the empirical relation. The method evidently is least objectionable on plots in which the heights of all trees come very close to the average. In general this was the case, with the exception of plot 4. Heights and corresponding crown-spreads here varied considerably. The farther they deviate from the average the more will the factors of suppression and competition for light come into play. For the purposes of the present study which deals

only with the general principle of evaluation of loss on an area basis as against a numerical basis the method suggested appears sufficiently illustrative. A more searching analysis of the silvical changes, in particular of the thinning effect in overstocked stands with widely varying heights, demands accurate measurements of actual heights and crown-spreads.

On the basis of the adopted standard an area is considered adequately stocked when the distance between the crowns of neighboring trees does not, or not materially, exceed the crown diameter established for the average height of the trees on each plot. The distance of one crown diameter between trees was intended to take care of increase in crown-spread in the next decade and is admittedly adopted on guesswork, in the absence of any guiding consideration resting on a more solid foundation. The adopted standard for adequate stocking permits at least to designate both an overstocking and, on the other hand, inadequate density down to a condition leaving no hope for a future stand.

Instead of attempting to express the conditions as found in the field directly in figures the individual trees are plotted in their exact relative position to each other. Solid dots indicate soundness and slight infection, hollow dots denote heavily infected and dead trees respectively. With a compass the crown-spread corresponding to the average height is drawn around each tree. In order to permit an easier visualization of sound and dead or doomed trees the crown-spreads of the former are given in solid circles and those of the latter in dotted circles.

INTERPRETATION

Figures 1-3 illustrate conditions as found on plots 3, 5 and 4. Of these 3 and 4 were of the plateau type, while plot 5 is located on the west side of the pass. The figures show plainly that the loss cannot correctly be expressed merely by the difference in planimeter values between the actual crown-spreads of the sound or dead trees in projection, a mode of presentation akin to that of giving the loss in per cents of trees killed. Isolated and detached trees never will make up a stand, and it is the stand only which in combination with neighboring stands finally makes up the forest. In the figures the natural bunching of the wild reproduction to organic groups immediately becomes apparent. A heavy broken outline is first employed to bring out more clearly the main groups as well as the bare spots determining the

character of the growing stand. This group boundary takes in all trees standing so close together that the distance from one crown circumference to the other does not exceed the standard crown diameter. The areas outlined therefore represent approximately the prospective forest cover of the growing stand as it would have appeared without



Figure 1

the interference of the disease since no other deleterious factors of a serious nature seemed to have been at work in the stand. From this forest cover a number of trees, indicated by hollow dots as doomed or dead, have dropped out. The altered conditions are now illustrated by outlining the resulting natural groups of living trees on the same

principle as before, but with a solid outline. The areas comprised within the latter represent the net actual forest cover left. By determining the area surfaces comprised within the solid and broken group outlines with the planimeter the reduction in forest cover of adequate density is readily determined. Both outlines do not slavishly follow

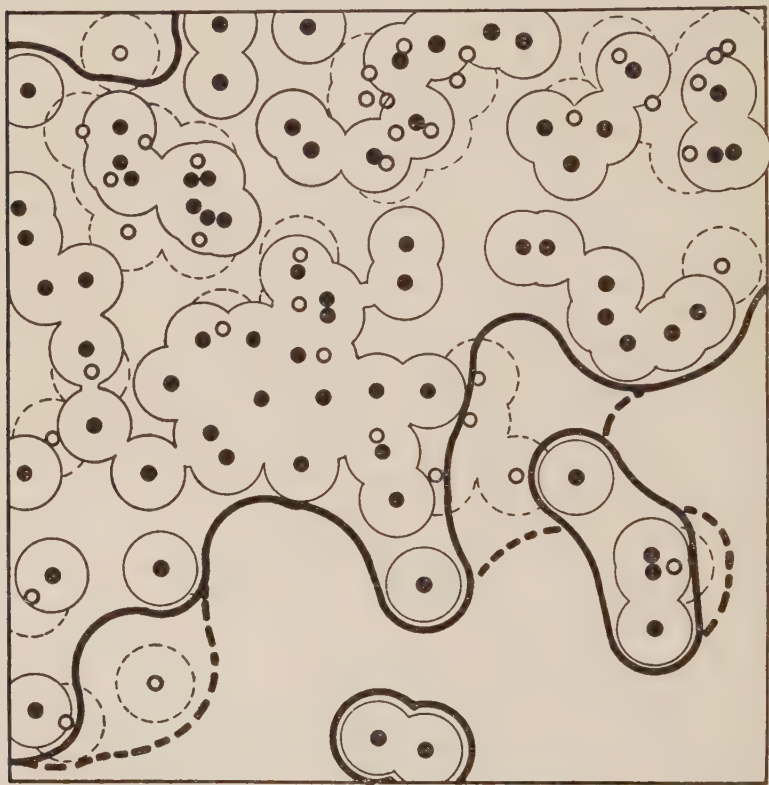


Figure 2

the contours of the crown-spreads. Growth is a function of time, and while it would be hazardous to foretell at what rate the crown-spreads on the fringe of the group are going to expand it must be legitimate practice to smooth out the contour of the group for the purpose of this study. Other investigators would perhaps have drawn the outlines differently, a little more closely or more widely. The result would undoubtedly have altered the size of the areas. The difference

can only be small as long as the same standard is followed in the smoothing out of the contours in both cases. After all, the object of this investigation is not so much to work out technique and exact methods as to illustrate a principle. Least of all does it attempt to emphasize the destructiveness of the disease here merely used as an example.

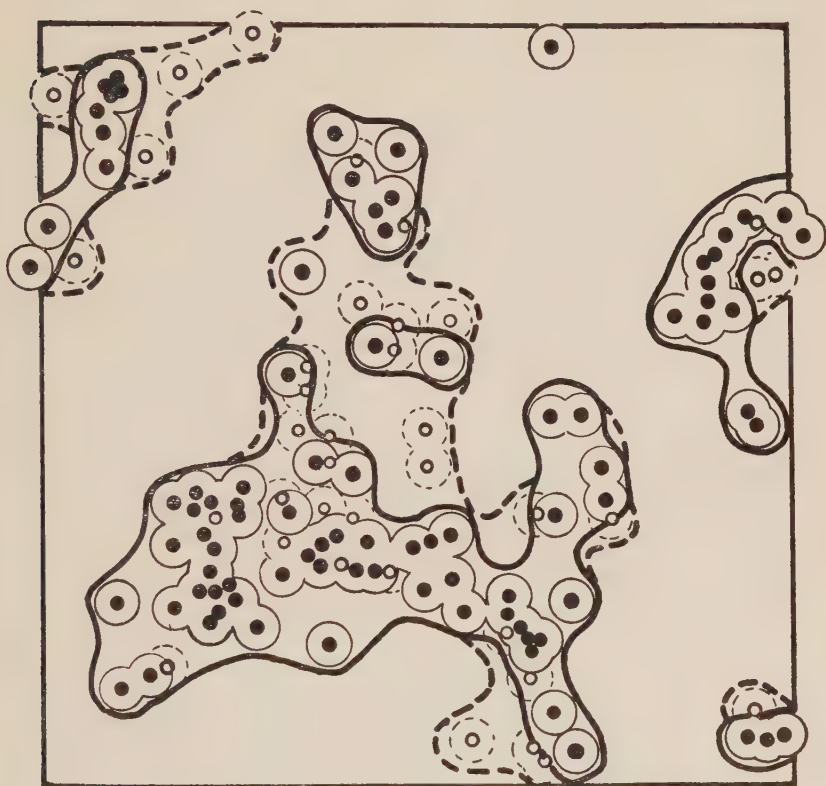


Figure 3

In Figure 1, average height 9.2 feet, a group appears in the lower right-hand corner. Much of this is heavily overstocked. Where it is less dense to the right, the rust has weakened the young stand leaving only three individuals standing. An isolated open group of three trees occupies a line towards the middle of the plot which, if undisturbed, in time might connect with the larger group. A single tree of doubtful

future is now left. The only other trees on the plot, completely isolated, are now dead. Their killing has no influence at all on the productiveness of the plot. In Figure 2, average height 13.5 feet, the space originally was fairly well filled, with exception of irregular patches in the lower part. The stand showed overstocking only in a few places, and generally the dropping out of killed individuals has remedied the situation. The disease has hardly broken up the continuity of the stand and the loss is limited to a whittling down of the boundaries of the group. In Figure 3, average height 7.6 feet, the plot originally held three well defined groups besides a small group of four closely spaced trees in the extreme lower right which did not combine to a unit with trees standing outside of the plot. The largest, central, group forms an organic unit with irregular outline. In the

TABLE I.

	Plot 3	Plot 4	Plot 5	Plot 6
Standing trees per acre.....	364	1270	1090	360
Average height of trees.....	9.2	7.6	13.5	17.8
Percent of trees dead or doomed.....	32	30	36	28
Percent reduction in actual crown-spread, due to killing (broken circles).....	28	28	20	17
Percent reduction in adequately stocked group area, due to killing (area difference between solid and broken group outlines).....	33	31	8	12

lower half it appears overstocked. This condition has been only partly relieved by the killing which was heavier in the more thinly populated portion of the group. The gaps which originally were not of a serious nature are now so large that the group is broken up into three of which the middle one now consists of only two isolated individuals, hardly ranking higher than the now completely isolated tree to the northwest. The group to the right has undergone but slight reduction. In the one to the upper right, consisting of a small and dense nucleus with a few widely spaced outposts, the killing has eliminated most of the latter without bringing relief to the crowded condition of the center.

Table I illustrates for the four plots 3 to 6 the difference in values obtained with the three methods discussed. Of all the possible approaches only the last one takes into account the future fate of the young stand. The per cents of trees killed or doomed are almost

the same for the four plots in Table 1 and come close to the average of 35 per cent for all six plots. On plot 1 it ran to 65 per cent and on plot 2 to 21 per cent. The reduction in prospective forest cover varies from 8 to 33 per cent for the four plots given in Table 1, with an average of 21 per cent. This reduction alone gives an indication of the actual loss from *Cronartium pyriforme* in yellow pine reproduction in the invaded region. The real loss in wood produced cannot become apparent until the affected stands have grown to commercial maturity.

CONCLUSION

It would be rash to apply the results and even the methods of this investigation to other killing forest diseases without modification as dictated by the habits of the injurious organism involved and by the character of the host species, its behavior in the stand and its relations to site and to its associates. In most cases the problem of evaluation of loss will be much more complex than that of *Cronartium pyriforme* endemic in a pure Western yellow pine type, growing in a region with little variation in site. Relatively few diseases will present so simple an aspect. As soon as we have to deal with mixed stands the problem becomes infinitely more involved. To the actual shrinking of productive units may be added the loss resulting from failure of replacement by the same species or from replacement by inferior or undesirable species. The release on an overcrowded stand, on the other hand, may result in a benefit and may, in certain cases, even favor species more valuable than the one they replace. In either case the time lost in the replacement or in the adjustment of neighboring trees to the new conditions must be considered in evaluating the damage.

Apart from its purely scientific interest, accurate determination of the loss caused by a given disease offers the only safe guide in a rational policy of control. None of the indigenous diseases killing young timber are at present systematically and aggressively controlled but very considerable sums have been, and still are being, expended in fighting imported diseases such as the chestnut blight and the white pine blister rust. At any time other foreign diseases of a similar character may break out in epidemic form, and new demands on public and private funds are certain to follow.

That the invasion of the United States by the chestnut blight and the white pine blister rust stands in the first rank with the great calamities which have befallen the American forests can no longer be

doubted by anyone familiar with the facts. The chestnut blight is already far beyond control and its ravages leave little to be done except salvage and, possibly, the substitution of the original stand by blight-resistant or immune strains or related species, and if that fails, by exotics which may replace American chestnut as a producer of lumber, tanning materials and nuts.

The white pine blister rust comes a close second to chestnut blight in destructiveness. Fortunately its existence is tied to the presence of susceptible species of *Ribes* as alternate hosts so that the severity of an attack stands in close relation to the *Ribes* flora in the immediate vicinity of the pines. This accounts, due consideration being given to climatic and meteorological factors, for the uneven character of the attack even in adjoining tracts of timber which in one case may be equivalent to complete elimination of white pine and in another may not be much more serious than that experienced from one of the many indigenous killing diseases. The disease has reached far beyond the stage at which it could be eradicated or even checked in its course, but individual stands can be protected effectually through the eradication of the alternate hosts, currants and gooseberries. In recent years the disease has spread alarmingly in Western forests. It is at present so close to the Idaho forests of Western white pine that the problem of control is one of immediate urgency. It will not be long before the California sugar pine forests will be in the same position. Control on a large scale in the vast Western forests with their mixture of species, with the rough character of the topography and the wealth of *Ribes* constitutes an extremely expensive undertaking. Here the ideal of an absolute control must give way to a system of repression under which the disease is tolerated but held down to the status of relative innocuousness. The question immediately arises as to what constitutes relative innocuousness. It cannot be answered in the same way for Western white pine in Idaho and for sugar pine in California. Western white pine in Idaho stands so high above its associates in intrinsic value that its elimination from the forest would leave the latter in a very serious condition. In the California pine forests sugar pine has close competitors and its destruction through the white pine blister rust, though a tremendous blow, would not bring utter ruin. Whatever the specific conditions may be, the fundamental principle must hold good that the criterion of loss is the effect on the productiveness of the stand.

PROGRESS IN FOREST PROTECTION IN THE SOUTH

By E. MURRAY BRUNER

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THE SOUTH A VERITABLE FOREST EMPIRE

Authoritative forestry statistics place the present day forest area of the United States at 470 million acres, including virgin, culled, cut-over and burned, or denuded, forest land. Of this vast forest area, approximating one-half billion acres, an aggregate of some 220 million acres, but slightly less than half of the total for the entire country, is comprised within the sixteen southern states, of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Oklahoma, Tennessee, Texas, Virginia and West Virginia.

The South may indeed be considered a veritable forest empire, embracing as it does three great and distinct forest regions, viz., Southern Appalachian hardwood, Ozark Mountains, and Southern pinery. By reason of such natural conditions as soil, topography and climate coupled with certain compelling economic factors, the Southern Appalachian hardwood region is destined to remain permanently a great reservoir of diversified and highly valuable timber, upon which the nation must chiefly depend for its future supplies of high-class hardwood products. The Ozark Mountain Region, lying entirely west of the Mississippi, in the three states of Arkansas, Missouri and Oklahoma, contains considerable areas of both hardwood and practically pure pine forest, as well as extensive stands of mixed hardwood and pine.

The Southern pinery, one of the world's most renowned forest regions, contains, in addition to its great expanse of pine forests, an aggregate of several million acres of splendid valley and river-bottom hardwood lands. Although it is not generally so regarded, it might not be inappropriate, nevertheless, to consider the lower Mississippi Valley, including the lower courses of its tributaries, as a distinct forest region.

PRINCIPAL FOREST ENEMIES

The unsurpassed rich forest resources of the South are by no means free from certain persistent and often insidious enemies. As is the case with forests of other sections insect infestations, notably those of the southern pine beetle, make their appearance from time to time. Fungous diseases of various kinds are constantly at work in bringing death, decay, and injury in many forms to standing trees, rough forest products and sawn timber. Such climatic factors as a long summer season, mild winter and abundant rainfall, which characterize the South, are highly favorable to the activities of destructive insects and fungi. At the present time, the most outstanding fungous attack upon standing timber is that of the deadly parasitic chestnut blight, which in spite of all efforts to combat it is rapidly exterminating the entire stand of chestnut, one of the most abundant and most valuable commercial species of the mountain and foothill sections of the southern Appalachians.

Unrestricted grazing must also be reckoned as a most active enemy of the forest in certain extensive areas of the South. It may be readily admitted that properly regulated grazing practice is entirely compatible with good forestry practice. The forestry interests of the South have but little quarrel with actual grazing on forest land. The controversy between forestry interests and grazing interests is confined almost entirely to the common practice of indiscriminate burning of the woods for the supposed benefit of the range. This age-old practice is widespread over extensive sections of several of the southern states. The practice, however, is greatly restricted and in fact is becoming rare in certain states, as in those which comprise the southern Appalachian group.

Hog grazing is a serious menace to longleaf pine reproduction, due to the fact that hogs root up the young seedlings and devour the succulent tap-root and tender rootlets. By the time the longleaf seedlings are 6 or 7 years old, they have become immune from the danger of being uprooted by the hogs.

The practice of turpentineing, as generally applied, must be considered a most active enemy of the longleaf—slash pine forest of the South Atlantic and Gulf Coast States. Without going into details, some of the outstanding faults of present-day practice in the turpentine operation from the standpoint of good forestry may be listed as:

- (1) Chipping trees below the recognized minimum size for profitable production;
- (2) Placing too many cups to the tree;
- (3) Chipping too rapidly and too deeply;
- (4) Making faces too wide;
- (5) Failure to allow proper rest periods; and
- (6) Failure to adequately protect the forest from fire.

Faulty forestry and lumbering practices are ever-present and active enemies of southern forests. The South, like the other timbered sections of the country, has had its extended period of wasteful lumbering. Utilization of the material cut has been far from complete. Trees too small to return to profit have been cut. Defective timber of all sizes, which should have been removed, has been left to the detriment of the future forest. In general, as the forest has been cut away the land has been left unprotected, and easy and certain prey to recurring forest fires.

Without doubt the most destructive agency of all, at least to young forest growth, is uncontrolled fire. This insatiate enemy continues, season after season, to exact its heavy toll throughout the length and breadth of the land. Year after year, it consumes, kills, or seriously damages great quantities of merchantable size material, but this readily evident damage to mature timber is of minor importance in comparison with the incalculable destruction and injury it brings to millions of acres of young forest growth of both pines and hardwoods. Furthermore, in its insidious way, the forest fire inflicts growing trees of all sizes with hidden wounds which retard growth, often bring death in a few years, and do inestimable damage by reducing potentially high quality wood into inferior or even worthless material. Nor is this all, but through the destruction of the mulch, or leaf-mold, the forest soil is deprived of a protective covering and a most valuable source of fertilizer.

PREVALENCE OF FOREST FIRES IN THE SOUTH

In no other of the major geographical sections of the country are forest fires so numerous, nor is such a large proportion of the forest area burned over annually, as in the South. Records compiled by the U. S. Forest Service for the nine-year-period, 1916 to 1924, inclusive, indicate an average of 47,147 forest fires per year in the

United States. These records show that, during the same period an average of 28,152 fires, or nearly 60 per cent of the total number for the entire country, were reported as occurring in the sixteen southern states.

It is a most significant fact that more than 97 per cent of all forest fires in the South are man-caused and therefore should be considered preventable. Lightning, the only source of fire not classed as man-caused, was responsible for only 2.6 per cent of the fires reported in the South from 1916 to 1924.

Among the classified causes of forest fires in the South as shown for the nine-year-period (1916 to 1924) incendiarism led with a total of 7,532 fires, or 26.4 per cent of the total number. Brush-burning accounted for the origin of 18.5 per cent; while campers, hunters, and smokers were responsible for 15.2 per cent. Each of these three principal causes of fire may, therefore, be considered a major problem within itself in the field of forest fire control. The large number of fires attributed to unknown causes, amounting to 13.9 per cent of the total number (and to very much more than this in some states), emphasizes the urgent need for greatly improved and extended fire detection facilities for the section as a whole.

Lest an erroneous impression be formed with respect to the incendiary fire situation in the South, it is believed a word of explanation should be given. Ordinarily, the incendiary fire is considered as one set purposely and with more or less malicious intent. It is the usual practice in the southern states to report all uncontrolled or wild fires as incendiary, if set on purpose, whether the element of malice is present or not. Thus the great number of fires set out for the purpose of burning the woods under either the firm conviction or more or less uncertain belief that such burning is beneficial to the range, necessary to the conduct of turpentine operations, or helpful in eradicating ticks, boll weevils, and other noxious insects, are all classified as incendiary when not considered in the category of legal, or controlled, fires, such as the legitimate burning of his land by an owner or authorized operator.

A detailed analysis of fires by states or groups of states would show wide variation in the number of fires and also area burned over in the individual states and groups of states. A few of the obvious reasons for these marked variations are:

- (1) Wide range in acreage of forest land;
- (2) Great diversity in the character of the forest cover in different regions as between the southern Appalachians and the Gulf Coast;
- (3) Great differences in the duration of the normal fire seasons in different regions, as between the southern Appalachians and the South Atlantic Coast;
- (4) Decided contrasts in the attitude of the general public toward the question of fire in the woods;
- (5) Marked variation in progress attained in organized fire control activities.

Even a brief consideration of forest fires in the South calls for at least a word of discussion on the length and character of the fire seasons. In the southern Appalachians, there are normally two distinct fire seasons each year, one in the fall of three to five weeks duration and another in the spring, lasting five to eight weeks. Usually, the spring season is the more severe and, while it may sometimes be prolonged to as many as 11 or 12 weeks, most of the fires generally occur in a short period of a very few weeks.

In the southern pinery and at least in the pine and mixed pine and hardwood portions of the Ozarks, the situation is quite different. In these regions the fall and spring fire seasons are not distinctly separated as they are in the southern Appalachians, although as a rule there is a period late in the fall and early winter when fires rarely occur. While the situation differs more or less in different minor regions or sections, yet it may be said that in general the fire season begins at the end of summer and continues, with more or less marked let-up in late fall and early winter, until the next summer when the new vegetation is well advanced. Even summer fires are not infrequent and sometimes there is in reality a 12-month fire season.

In 1925, according to U. S. Forest Service records, 1.76 per cent of the entire area of forest land in the United States under organized protection, including the national forests, was burned over. During the nine-year period, 1916 to 1924, the average annual area burned over in the sixteen southern states amounted to 5.2 per cent of the total forest area. In view of the fact that only eight of the sixteen states had forestry organizations in 1924 and only five of these were in existence in 1916, it appears reasonable to consider this figure as

to percentage of area burned as very conservative. Anything even approaching complete figures on forest fire areas could not be expected in states lacking state forestry organizations.

The belief that forest fires are more widespread than reported from unorganized states and sections is greatly strengthened by information contained in the bulletin "Forest Fires in Florida" prepared by Harry Lee Baker and published by the Florida Forestry Association in 1926. Mr. Baker states that as much as 75 per cent of the pine forest area of Florida burns over each year. And so, while the situation in Florida may represent the extreme in forest area burned, yet there is every reason to believe a very large proportion of the unprotected forest areas of a number of the southern states is burned over annually.

STATUS OF ORGANIZED FIRE CONTROL

By 1924, the eight states of Alabama, Louisiana, Maryland, North Carolina, Tennessee, Texas, Virginia, and West Virginia had active state forestry organizations and had succeeded in extending a measure of organized protection to approximately one-half of their total forest area. The actual percentage under protection varied considerably in the individual states, but only in the case of Maryland did it include all forest land in need of protection.

The four states of Georgia, Kentucky, Missouri and Oklahoma initiated state forestry work in 1925, thus making that a banner year indeed in southern forestry progress. In 1926 Mississippi joined the ranks of organized states through the establishment of a state forest service. During 1927 state forestry commissions were established in Florida and South Carolina, and it is expected that these two states will initiate organized forestry activities during the first half of 1928 by the appointment of state foresters. In the case of South Carolina, the legislature failed to make an appropriation during the 1927 session, but special efforts are being put forth to secure an appropriation when the Legislature convenes again early in 1928. Thus, at the end of 1927, Arkansas was the only southern state without an official state forestry organization.

Table No. 1 contains essential fire control statistics for the forest lands, exclusive of national forests, in the sixteen southern states, as of December 31, 1927.

TABLE 1
FOREST AREAS AND STATUS OF PROTECTION EXPENDITURES FISCAL YEAR 1928.
(not including national forests)

State	Area needing protection Million acres	Area under organized protection Million acres	Funds available for protection	Funds required for adequate protection	Deficiency in funds for adequate protection	Percent of required funds available
Alabama	20.00	8.52	\$82,760	\$450,000	\$367,240	18.4
Arkansas	20.50	None	.....	500,000	500,000	....
Florida	18.28	None	19,500	411,300	391,800	4.7
Georgia	20.00	1.75	93,056	450,000	356,944	20.7
Kentucky	9.00	0.50	28,800	225,000	196,200	12.8
Louisiana	13.50	8.00	128,520	342,200	213,680	37.5
Maryland	2.20	2.20	38,955	66,000	27,045	59.0
Mississippi	17.00	0.51	92,305	425,000	332,695	21.7
Missouri	13.00	unknown	22,000	276,400	254,400	8.0
North Carolina	19.50	10.00	96,598	487,500	390,902	19.8
Oklahoma	8.00	1.50	28,460	160,000	131,540	17.7
South Carolina	10.00	none	13,000	225,000	212,000	5.8
Tennessee	10.00	7.50	47,327	250,000	202,673	18.9
Texas	14.03	8.30	62,795	359,200	296,405	17.5
Virginia	14.97	9.50	61,982	364,600	302,618	17.0
West Virginia	8.00	4.70	79,170	175,000	95,830	45.2
Totals.....	217.98	62.98	895,228	5,167,200	4,271,972	17.3 Av. %

As indicated in Table 1, an aggregate of approximately 63 million acres of forest land in the sixteen southern states were being afforded a measure of protection by the end of 1927. This was 28.8 per cent of the total area considered as being in need of organized protection. The percentage of total area under protection in individual states varies from zero in the cases of Florida, Arkansas and South Carolina to 100 per cent for Maryland, 75 per cent for Tennessee, 60 per cent for Louisiana, and 59 per cent for West Virginia. As would be expected, the bulk of the protected area at present lies in the states which have had active forestry organizations for several years. As a matter of fact, about 56.5 million acres, almost 91 per cent of the total protected area, are contained in the seven states of Alabama, Louisiana, North Carolina, Tennessee, Texas, Virginia and West Virginia.

In the matter of fire control expenditures, it is found that for the sections as a whole but little more than 17 per cent of the amount

required for adequate protection of all forest land is actually being spent. Table No. 1 indicates a very wide variation in the percentage of required expenditures as being made by individual states, the per cent figure ranging from zero in the case of Arkansas to 59 per cent for Maryland, 45.2 per cent for West Virginia and 37.5 per cent for Louisiana.

PRIVATE, STATE AND FEDERAL CO-OPERATION

The co-operative movement in forest fire control, as between the Federal Government and the several states, dates back to the passage of the Weeks Law in 1911. Previous to 1924, the Federal Government did not recognize private expenditures made under state supervision as a basis for determination of the federal allotment to states and consequently there was no incentive for the development of private co-operation as a means of securing a greater amount of federal financial aid. Nevertheless various states, especially some of the far western states, encouraged private participation in organized fire control to a notable extent. In the South, however, little progress was made in this direction except in a very few states, among which West Virginia was an outstanding example.

The exact acreage of forest land being protected at the end of 1927 under voluntary co-operative agreements between the state and private owners, or upon the basis of assessments made by law, as in the case of West Virginia, cannot be stated in the case of every state. But based upon definite information from most of the states the following figures can be given:

Louisiana—a little more than three million acres;

West Virginia—slightly over two million acres;

Georgia—one and three-fourths million acres;

Oklahoma—about one and one-third million acres;

Mississippi and Virginia—each a little under three-fourths of a million acres.

Kentucky—a little under one-half million acres.

With the possible exception of one state, for which definite figures are not at hand, no one of the other states has as much as one-half million acres.

As indicated in Table No. 2, the three states of Maryland, North Carolina and Virginia have succeeded in procuring considerable finan-

TABLE 2

SOURCES OF FIRE CONTROL FUNDS AND NUMBER OF COOPERATING ASSOCIATIONS COMPANIES AND INDIVIDUAL OWNERS, PER 1928 BUDGETS.

State	Source of funds				Total Funds	Additional Private Funds	Number of Cooperators
	Federal Allotment	State appropriations	County Funds	Private Contributions			
Alabama	\$38,360	\$29,700	.....	\$14,700	\$82,760	.....	5
Arkansas	.....	.....	.....	.....	.....	.....	0
Florida	7,000	12,500	.....	.....	19,500	.....	0
Georgia	39,130	10,500	.....	43,426	93,056	.....	9
Kentucky	14,400	10,000	.....	4,400	28,800	.....	4
Louisiana	32,607	55,000	.....	40,913	128,520	.....	17
Maryland	6,490	25,143	4,977	2,345	38,955	2,345	4
Mississippi	33,655	15,000	.....	43,650	92,305	.....	6
Missouri	11,000	10,000	.....	1,000	22,000	1,000	5
North Carolina	41,438	28,110	21,600	5,450	96,598	.....	10
Oklahoma	13,710	6,750	.....	8,000	28,460	8,000	1
South Carolina	5,000	.....	.....	8,000	13,000	.....	4
Tennessee	21,250	24,000	.....	2,077	47,327	.....	5
Texas	30,862	31,933	.....	.....	62,795	.....	0
Virginia	30,991	18,058	6,058	6,875	61,982	.....	8
West Virginia	18,232	33,685	10,000	17,253	79,170	.....	*156
Totals	344,125	310,379	42,635	198,089	895,228	11,345	

* A total of 1,725,284 acres of privately owned land in 156 holdings under cooperative protection, of which total area 1,466,568 acres are included in two large cooperative associations.

cial aid from counties. Efforts to develop county co-operation in these states were initiated several years prior to the enactment of the Clarke-McNary law, which law is designed especially to encourage private co-operation. In the case of North Carolina, it will be noted that the county funds budgeted for 1928 amount to \$21,600, while the state appropriation proper is but \$28,110.

In the case of West Virginia the counties are required by law to pay the fire suppression costs. During a normal year the counties within the organized protective areas expend about \$10,000 for payment of fire suppression bills incurred under the supervision of the state fire control organization.

It is of interest to note that the Virginia legislature enacted a law in 1926 providing that counties pay fire suppression costs approved by the state forester. During the latter half of 1927 about one-third

of the counties in the organized protective areas were operating under this new law which, however, eventually will be applied in all co-operating counties.

FIRE CONTROL PERSONNEL

With a single exception each of the states organized prior to 1927 employs a state forester and at least one (and in most cases several) additional technically-trained foresters to direct the fire control work. As a rule, there is an assistant state forester who, under the general supervision of the state forester, is charged with the direction of the organized fire control work throughout the state. In most cases, as for instance in North Carolina, Tennessee and Virginia, the state is divided into a number of administrative districts with a member of the state forestry staff in charge of each district. In the more recently organized states, as well as those older in the work, the technical forestry staffs are being steadily enlarged as the fire control activities expand and more funds become available.

A detailed discussion, as would be necessary to set forth the actual functioning of the various individual state forest fire control organizations, is entirely beyond the range of the present paper because of the space such a discussion would require.

IMPROVEMENTS AND EQUIPMENT

As a section, the South has made very little headway in the matter of providing improvements and equipment recognized as essential to efficient forest fire control work. Maryland, with eight fire towers in operation in 1926, had the largest percentage of its forest land under the observation of lookouts stationed in towers.

In total number of towers, however, West Virginia has a commanding lead. Since 1920, there have been constructed in West Virginia some 30 all-steel towers, each provided with essential equipment including more or less ample telephone facilities. The effectiveness of the fire control organization in West Virginia, which is built around the tower system, is attested by the fact that the average size of all fires within areas having towers has been only 50 or 60 acres during the past three or four years, whereas fires for the entire state averaged several hundred acres in size previous to the development of organized fire control.

At the beginning of 1926 fire towers were to be found in only

four southern states and the total number was only 50. During 1926 and 1927, however, a start in fire tower construction was made in several states, and the present indications are that very material progress will be made in the provision of towers and telephone facilities in a number of states during the next few years.

As recent as the beginning of 1926 the value of all fire fighting equipment, including improved fire tools and water pumps, amounted to only about \$10,600 for the entire group of southern states with forestry organizations. One state which had been organized for ten years or more had purchased no fire fighting equipment whatsoever. As in the case of fire tower construction, however, the two years 1926 and 1927 witnessed a material advance in the provision of fire tools, especially in certain states; for example in Kentucky and North Carolina.

A practice which is commanding increasing interest and has shown rapid development during the past few years is the use of machinery and improved tools in the construction of fire lines in certain sections of the southern pinery. For instance, in the turpentine belt of southern Georgia marked progress was made during 1927 in the construction of fire lines through the use of tractors and plows. A notable demonstration was held at Brunswick, Georgia, during the summer of 1927. Pressure torches and hand water pumps are used in the burning of strips in connection with the construction and maintenance of fire lines.

LEGISLATION

No treatment of the forest fire situation could be considered complete without some statement bearing on the highly important subject of state forestry legislation. Nevertheless, a detailed statement of the status of legislation in the individual states cannot be included in the present discussion. A few of the states, notably Alabama, Louisiana, Maryland, Virginia, and West Virginia, have made very considerable progress in certain phases of forestry legislation. Alabama and Louisiana have taken the lead in severance tax legislation applying to lands set aside for reforestation under definite contract between the owners and the state. Kentucky, Louisiana, Maryland, Virginia, and West Virginia are looked upon as having effective railroad right-of-way clearing and locomotive spark arrester laws. Virginia and West Virginia have laws requiring counties to pay fire suppression costs, while West Virginia also has a compulsory fire patrol law.

While, perhaps, each state has one or more statutes prescribing penalties for malicious or wilful setting of forest fires, yet in a number of cases these statutes are in need of amendment or revision to make them fully effective under present-day conditions. On the other hand, some of the states not only have reasonably satisfactory statutes dealing with incendiary fires, but have in recent years broadened the scope of their "anti-fire" statutes so as to prescribe penalties for fires due to carelessness or negligence such as those resulting from campfires, lumbering operations, burning fields, clearings, etc. With possibly a few exceptions, however, the southern states are still without statutes providing for slash disposal, closed hunting seasons and brush-burning permits.

Thus, in spite of the fact that several states have made a splendid advance, it must be admitted that as a large group of states constituting a major forest region the South has yet much to accomplish before it can present a forest fire control legislative program sufficiently advanced to meet in a reasonably adequate way the requirements of the situation as it now exists.

FIRE CONTROL IN RELATION TO INDUSTRIAL FORESTRY

Except incidentally, in relation to forest fire control, no effort will be made in the present connection to discuss the exceedingly important subject of industrial or commercial forestry development in the South. It should be accepted as obvious that dependable forest fire control is indispensable to the general development of industrial forestry. Permanency in operation is a fundamental requisite to industrial forestry. There can not be permanency in operation unless there is continuous production of timber and continuous production upon a profitable basis is possible only on forest lands which are adequately protected from recurring fires.

As indicated in Table No. 1, for the South as a whole considerably less than one-third (about 28.8 per cent) of the entire forest area is being afforded even a measure of protection from fire and less than one-fifth (about 17.3 per cent) of the funds necessary for adequate protection is actually being expended. In spite of this extremely poor showing, the fact remains, nevertheless, that industrial forestry is making definite progress in certain restricted sections, and the outlook for its widespread development is becoming more encouraging day by day. Undaunted by the slow development of organized protection, a few

large owners and operators of forest lands in widely scattered sections of the South began some years ago to undertake the conversion of their forest lands into permanent timber-growing properties. By 1922 there were known to be more than 20 such holdings in the various southern states, and the last five years have witnessed a steady increase in the number.

In a bulletin: "Progress in Commercial Forestry," published in November, 1927, by the Natural Resources Production Department of the U. S. Chamber of Commerce, it is brought out that 51 concerns in the South, in response to a questionnaire, furnished information indicating that they were endeavoring to handle their lands with a view to continuous operation. While in some cases only the most simple forestry principles are being applied, this inquiry of the Chamber of Commerce brought out the fact, however, that in certain instances the most intensive systems of forestry on private lands in the United States are being used, and on relatively large scales. Altogether the 51 reporting concerns own some 6,638,770 acres of forest land, two-thirds or more of which is cut over. A little more than five million acres are owned by 38 lumber companies, while the remainder is in the hands of eight pulp and paper companies and five naval stores operators. As concerns located in the southern Appalachian hardwood region were reported with concerns from the north central region rather than with concerns from the South, their number and acreage owned cannot be stated. It is known, however, that several large lumber, paper and coal companies in the southern Appalachians are engaged in the practice of commercial forestry in varying degrees of intensity.

These concerns in the South, including the southern Appalachian hardwood region, are truly pioneers in commercial forestry. Without waiting for the establishment of public forest fire control agencies prepared to give adequate protection from the ever-threatening menace of recurring forest fires, they have boldly ventured into the field of permanent forest production. It must not be inferred that they did not carefully weigh or fully appreciate the magnitude or seriousness of the fire menace, for as a matter of fact there is among them the general conviction that uncontrolled fire is the greatest single handicap to reforestation or permanent forest production with which they have to contend. As staunch supporters of practical movements for the reduction, control, or elimination of forest fire, they do not hesitate to expend their own funds in generous proportion, either singlehanded

or in co-operation with public or private agencies. They had faith in the future when they launched their enterprise and that faith included a firm conviction that adequate forest protection as an economic necessity would eventually come with the awakening of general public appreciation of forest values.

CONCLUSION

Until very recently, it must be admitted, the southern states as a group made slow progress in the monumental task of providing organized protection for the great wealth of southern forest resources. Measured merely in terms of proportion of area under organized protection and percentage of required funds actually being expended, it must further be admitted that even yet, the South, as a region, has barely made a start in forest protection. A detailed discussion of the various reasons why the South has been so slow in the development of effective forest fire control practices would require much more space than can be given at this time. It is hoped, therefore, that brief mention of a few of what are considered the more significant factors or underlying reasons will suffice for the present purpose.

In the first place, the South, as a region, had until very recently looked upon its original forest resources as practically inexhaustible. In fact heavy inroads upon southern forests did not begin until the virgin forests of other regions east of the Great Plains and the Rockies became pretty well exhausted. Consequently it was but comparatively recently that the serious effects of large scale lumbering and the periodic occurrence of fires over cut-over lands began to be realized by an appreciable proportion of the general public.

In the second place, it has not been easy for the every-day citizen to appreciate the extent of damage wrought by recurring fires in southern forests. As a rule fires in both the hardwood and pine forests of the South lack the spectacular aspect which so often characterizes the fires in some other sections of the country, because ordinarily fires in southern woodlands do not develop into crown fires which consume or kill outright the large timber, the casual observer fails to see the very real damage done the forest through the destruction of young growth, more or less hidden injury to larger trees and loss of the protective leaf covering, etc.

A third and very potent reason for the slowness of the South in the development of effective forest fire control activities is to be found

in the wide-spread attitude of mind which accepts fire in the woods as inevitable and even beneficial. The belief that fires are sure to occur and that they are often beneficial rather than injurious has persisted so long that it has become traditional among no small proportion of the population in various sections of many of the southern states. This unfortunate traditional attitude of mind is thought to account in very large measure for the great number of purposely set forest fires in the South and for the wide-spread apathy or public indifference to the problem of fire control.

In spite of the present poor records as to area under protection and funds being expended for fire control, and notwithstanding the wide-spread public apathy which has prevailed in regard to the forest fire problem, careful consideration of all the factors involved leads, nevertheless, to the belief that the stage is now set for ushering in an era of such unprecedented progress as bids fair to bring to the South leadership over all other sections of the country in private or commercial forestry. With 15 of the 16 southern states now having forestry organizations—including the newly-created forestry commissions of Florida and South Carolina—there is every promise that forestry in the South, from the standpoint of public support, is finally in a position to make rapid and permanent progress. What is needed above everything else to assure the early realization of such progress is a sustained educational drive so thoroughly organized and intensified that the underlying facts of the forestry situation in each southern state will be driven home to the greatest number of citizens of all classes it is possible to reach.

There are, of course, various necessary objectives to be attained before the final success in forestry development can be realized. Chief among these may be mentioned legislative actions providing for adjusted taxation of growing forests and forest lands, and other measures favoring reforestation; the procurement of greatly increased funds, including federal aid, state appropriations and private contributions; and development of general public appreciation of forest values and the absolute necessity of protection from forest fires. It may be confidently expected that comprehensive state forestry policies of programs embodying these and other essential matters will be steadily developed and that eventually there will be evolved a genuine forestry program for the South as a section.

The South, as a major geographical division, is characterized by

soil, topography and climatic conditions highly favorable to rapid and diversified forest growth. Furthermore, the region occupies a most strategic geographical position in relation to the great industrial centers of the eastern half of the country. On the whole lumbering is relatively easy and cheap and transportation facilities ample. It is recognition of this unusually favorable combination of natural conditions and economic factors which has led so many students of forestry to proclaim with such insistence that the South is the most promising general region for continuous forest production in the entire United States. Likewise it was appreciation of this highly favorable condition which induced the pioneers in industrial forestry to invest their capital in southern forest properties and to pin their faith to the eventual development of favorable forest taxation, public understanding of forest values, and adequate forest protection.

THE IMPORTANCE OF WILD LIFE AND RECREATION IN FOREST MANAGEMENT

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In nearly all cases where forest management is attempted, the perfection in the working plan and the technical application of silviculture are limited by the calculated income from the forest. Unless this is the case, the work is purely research, and must be limited to experimental areas. Practically all working plans that have come to my notice, calculated income solely from tree products.

It is the purpose of this paper to point out possible sources of revenue from recreational use of the forest, and from wild life. The social and educational phases of both recreation and wild life are touched rather lightly, though, in the last analysis, we must admit these phases of the problem may be more important than the return of mere money.

At this point a discussion of terms is quite essential. "Forest Management" has usually meant the management of the land relative to the maximum protection of timber material produced from trees and converted into money. "Forest Products" and "Forest Utilization," as I am accustomed to the terms, have meant tree products, and the use or manufacture of tree materials—timber poles, pulpwood, turpentine, wood alcohol and so on. I believe that forest management should include the treatment of *all the forest*. That is, all wild life inhabiting the ground, the air, the trees and the contiguous waters, and any other economic use, such as organized recreation. Nor can the social and educational values be ignored. Mineral wealth need not receive much attention, for the presence of valuable minerals usually over-shadows other products to such an extent that the minerals only are considered. The relation between mines and timber is very close, but somewhat outside this discussion. The same is true of attempting a distinction between forest and park. To me a park means an area where social, educational and recreational uses are paramount, while a forest should mean lands for economic use. This does not, or should not, mean that a park must be devoid of financial gain or a forest exclusively for the production of the material wants of man. A certain overlapping is inevitable.

The preceding paragraph has implied my conception of what forest products and forest utilization should mean—products of the *forest* and the use of *forest* materials rather than confinement to materials produced in trees. And the economic “products” we are discussing will be possible incomes from recreational uses, game, fur, and game fish.

It must be continuously kept in mind that silviculture—the actual *growing* of a timber crop is the basis of real forestry, and that very often all else is subsidiary to this crop growth. But, to return to the implication in the first sentence of this paper, we must remember that silviculture in the United States has had trouble in paying suitable interest on the investment. Interest rate has been discussed for some years without very definite results. We should perhaps attempt to determine what calculated silvicultural returns are, before attempting to show how other revenues may be brought to the aid of incomes from growing trees. Even in the perhaps rare instances where silviculture alone pays satisfactory interest, there is no reason why other sources of revenue should not be used.

There are varying opinions on interest rates. I believe some foresters have erred in expecting a rate that was too high. An article by Guise in the October, 1922, JOURNAL OF FORESTRY gave 4 per cent compound and 6 per cent annual interest as about right. A disagreement was expressed by Pulling in the April, 1924, JOURNAL, where 3 per cent was considered the *maximum* net forest income that could be applied to the whole country at present. Belyea and Woolsey, in “A Forest Policy for New York State” in the January, 1925, JOURNAL, make the following statement on page 11:

“It would clarify matters if it were generally admitted at the start that permanent forest investments pay low rates of interest on the capital tied up in the growing stock.”

Just what “low rates” are is not stated. I assume it would mean from 2 to 3 per cent. These gentlemen admit their statement, but seem to imply that others do not.

Some foresters in the United States have evaded this issue. I believe some have camouflaged the low interest rate. They know about it, but refuse to discuss it or else inflate it because they are afraid of discrediting forestry as a business. If my hypothesis is correct, we are ignoring sound economic principles, and forgetting that wood products *must* be grown no matter what the interest rate may be.

Filibert Roth, on pages 26 to 29, inclusive, in *Forest Valuation*, states the following facts:

"Farm incomes and Forest incomes are about the same—consistently under 3 per cent.

The State Forests of Saxony (good paying forests) made 2.3 to 2.6 per cent over a period of forty years.

Germany (1916) used an interest rate of 3 per cent or less, and Baden 2½ per cent in all calculations of values of land, timber, or forest.

Although Professor Roth made these statements in 1916, I believe they apply as well today. He further states that many farmers make nothing at all on their investment, and do not get farmhand wages. This is startling, but true. Yet farming is going to exist. And timber will be grown just as surely as wheat and potatoes.

Many ideal forests both here and abroad make high interest rates and these (especially white pine in New England) are used extensively as illustrations. Belyea in "Will a County Forest Pay?" in the *Illustrated Canadian Forestry Magazine* for March, 1923, includes a picture of a planted white pine forest that paid 7 per cent. I fancy it is the ideal pine lands of Southern New Hampshire or Massachusetts. Much of the high interest rate propaganda has come from this section. Belyea gives 5% as the interest rate, but says: "It is not too low. In fact, it is rather high." He intends his figures apparently to apply to the ideal forest of a county or municipality, rather than a whole region, and, in that narrow sphere, they may be quite correct.

Chapman in *Forest Valuation* is not so definite as Roth or Belyea. He carefully explains that savings banks and life insurance are the only commonly known investments where compound interest is used. He also goes into detail as to the economic laws affecting investments, emphasizing the fact that greater risk demands higher interest rate. He compares simple and compound interest and touches on limitation of opportunity and expansion until equilibrium is reached. He denies that a long investment should require a higher interest rate. He ends the chapter on page 34, with the following paragraph:

"If these arguments are admitted, it is possible to show that the income which may actually be earned by forest investments covering long periods, will be equivalent to the rates demanded by the character of the investment, even though the earnings may fall as low as 3 per cent for periods of over 50 years, and 2½ to 2 per cent for periods exceeding 100 years."

A comparison with agriculture is not made nor is an average growth increment given. It is dangerous to attempt to give an average growth increment but sometimes it may be necessary. Chapman also omits, I believe, figures showing actual earnings of regulated forests in terms of percentage on the investment. In Europe, as we have seen from Roth, fairly definite percentages are known.

But *income* in Europe, which is often very large in well regulated forest lands, may not be any criterion as to interest on the investment. My figures from high income forests in Europe are too vague to be quotable, but I am under the impression that where a net profit of several dollars a year an acre is produced, the capitalization is very high, and the percentage not great.

One might quote many other authorities to show that the business of growing timber may pay low returns. In a lecture on December 19, 1924, at the New York State College of Forestry, Dr. Schenek, mentioned $2\frac{1}{2}$ per cent as the average interest return, though returns might go up to 10 or 20 per cent.

Back in 1911, Kellogg and Ziegler wrote a bulletin, called "The Cost of Growing Timber," published by the *American Lumberman*. They give 4 per cent as a conservative rate that must be obtained for the private investor, and their figures show that white pine and loblolly pine would pay better if fully stocked land were available at \$10 an acre. Their figures were \$3.00 for the land and \$7.00 for planting, which is too low now, but taxes and stumpage prices are more favorable than in 1911. The writers also predict that the increased rate in stumpage values will soon make it profitable to grow red oak, yellow poplar and Douglas fir. These gentlemen end the bulletin by stating that unless the public is willing to accept these low rates of interest, it will be best that a large percentage of the permanent timber land be acquired by the Government. The last sentence reads: "The chief concern of the State and National Governments is the public welfare, and, moreover, they can profitably engage in operations at an even lower rate of interest than 4 per cent."

Other examples showing low interest rates in the business of growing timber might be given, but these are perhaps enough. The increase in the paper business, with the short rotation and heavy manufacturing investment, has made it possible to consider the reforestation of spruce, balsam, poplar, and other typical pulp woods. But, on the average, very few trained men feel that they can afford to buy waste land and plant

it, or wait for reproduction, and get a paying percentage from tree growth.

So we now have the interesting problem of attempting to help out silviculture with recreation and wild life. Anyone interested is beset with conflicting ideas. Many of us despise the thought of commercializing recreation in the woods, even as we may question professional athletics, public dance halls, and so on. It is a serious question. The automobile is both ruining and making the woods. It has increased travel, and thus increased interest in "getting out"; yet it has turned an untrained horde into the open country to pollute, cheapen, despoil, burn and steal either private or public property. A beautiful section is made accessible for exploitation. It is advertised and "improved." Mount Washington is possessed of an automobile road and a railroad, but it is injured badly for people who want to keep beauty spots free from luxury. Wonderful Mount Katahdin is still accessible only by some three rough trails, but I fear it may be "improved" (another word for ruined) in a few years. We rightly want to get people into the woods, but we do not want them there before they are trained in handling themselves. And we want them to go in right, and "right" usually means either by canoe or afoot. The greatest luxury being a pack horse or tote wagon for supplies, or occasionally a buckboard for those who are too old, too young, or too ill to walk or paddle.

True, to commercialize the woods, even for lumber and pulp, and for fire protection, we need motor roads. Camps and hotels must have transportation. But, in this commercialization, we must keep from seeing a potential camp or hotel site on *every* beach on *every* lake. Nor should every mountain notch and every square mile of public land be exposed to the smell of gasoline. I am emphasizing these points, for I want no one to infer that I favor unlimited recreational exploitation of either private or public land. But both wild life and recreation may be exploited reasonably. The stand should remain "fully stocked" in these as in other forest enterprises, and, fortunately, the income can continue from these sources in woods where there is scarcely a stick of merchantable timber.

As an example of wild life and recreational possibilities, let us consider the State of New York.

We may first study the private organized camps. New York rates third among the states in number of camps at the present time. According to Sargent's Handbook for 1926, published by Porter Sargent

of 11 Beacon St., Boston, there are 141 private organized camps in New York. There were 97 listed in the 1924 Handbook, so the increase is rapid. They vary in size. One I have in mind takes care of 275 boys. Few are as large. Some have only 25 or less. An average of 50 campers would be a conservative estimate. If this is the case, upwards of 7,000 campers go to the woods, employing nearly 1,550 camp counselors, besides as many laborers. These campers spend on an average about \$300 each for *camp fees alone*, to say nothing of travel, uniforms, and all extras. The gross income of these 141 camps would be \$2,115,000 to say nothing of extras, which would bring the expense to the campers about to the \$3,000,000 mark.

These are conservative estimates, and the camp business has just started. Nor have I considered the Boy Scouts, Camp Fire Girls, and numerous other institutional camps that cater to a vastly greater group at much less expense. Anyone with a flair for figures may make some interesting computations from Sargent's Handbook, as well as from an article by Lehman in 1924 "Camps and Camping" of 45 Rose St., New York. Probably the investment in those 141 New York camps is upwards of four million dollars, all possible because of the woods.

Then, if one considers the woods hotels, and the guiding business, another large source of income is disclosed. The exact numbers who spend money in woods recreations, or the amount they spend, is hard to determine. But probably the average New Yorker spends \$5.00 for every day he goes to the woods or the bank of the wooded stream or lake. Under the present New York State law, one-half of all money received from hunting and fishing licenses goes to the Conservation fund. Secretary Rogers of the New York State Fish, Game and Forest League, has estimated the Conservation fund revenue to be \$400,000 by January 1, 1927, after being in effect only one year and a half, with the combined license starting January, 1926. Figures are not yet available, but a half million hunting, trapping and fishing licenses may be sold this year and perhaps many more than that. Every one that buys a license spends more money, and he spends it to get into the woods or on the water protected by the woods.

We may be able to capitalize the actual food value of game and game fish. As far as getting game meat is concerned, most men could earn the money to buy more meat in the time they spend hunting. I consider hunting to be recreation primarily. But the meat is an important by-product, and the land that produces the game, *would not* produce

much or any other human food. A forest fully stocked with game produces food and a lot of it. Management should be such that the winter food supply of game is adequate, and that stocking is up to the amount of game that the winter food supply will support. I have been through many square miles of such land in Canada, where the stocking of moose and deer was as heavy as it should be. In fact, deer may have been overstocked, thus causing a flow to a less fully stocked area.

At this point foresters may well consider game food. Burnham, in the February, 1926, Bulletin of the New York State Fish, Game and Forest League, criticized the average forester's ideal of all "high" forest types. That there were insufficient provisions for scrub and sprout land for deer food. My own opinion—and it is based on experience as a deer hunter rather than as a silviculturist—is that there is no cause for alarm in this respect. That too much high forest cannot be produced in New York, and if there were too much, the process of bringing it back to scrub and sprout would be easy. Yet it is a thought from an old deer hunter that I have been expecting to hear for some years. Foresters have been at least intimating that their reforestation and fire prevention was the salvation of game, yet perfect game cover may exist in a forest that is hopeless from the standpoint of merchantable timber. And fire, if it comes so late in the season that young birds and animals can travel, and does not cover too large an area, may actually improve game food. Big fires, or spring fires, are as tragic to game as to man and the trees.

The fur supply is another forest product. Some fur animals live in fairly open country and marsh land, but a certain amount of forest cover seems necessary for fur production. It is quite certain that most fur life would disappear if tree growth is largely destroyed. I have some rather incomplete figures for New York which form the basis for an estimate that a return of about \$2,000,000 per annum to the trappers of the state is a fair average. Much fur is shipped outside the state—some as far as St. Louis—so exact figures are not available. Of course the principal fur bearers of the State are now supplemented by the beaver. On the other hand, otter, martin, and fisher are now so scarce that they are hardly a factor in the business, and must have immediate protection to be a future factor.

Regarding the beaver, Dr. Johnson, Acting Director of the Roosevelt Wild Life Forest Experiment Station, and an authority on beaver, has received estimates from large fur dealers that show that probably

5,000 beaver skins were taken during the first open season in New York (March, 1924) and some estimates go much higher than that. Some skins averaged \$20 each. Few, according to Dr. Johnson's records, were worth less than \$15. I have his permission to say that he believes the annual crop can be this size if careful management becomes a fact. The March, 1925, crop of beaver was probably smaller than 1924, and the season was closed in 1926. The beaver have made enemies, but, aside from anything sentimental, if a cord of poplar, on the stump, can feed a beaver that will grow into a \$20 skin in a couple of years, any land suitable for beaver can scarcely raise a better crop. Again, fisher are worth up to \$125 or more. If an acre of brush will feed a few rabbits that will grow a fisher skin, *that* is forest utilization of an intensive sort. And the fisher is an animal of the big timber. New York State is *not* fully stocked with fur-bearing animals. If the Adirondack and Catskill preserves were under exact fur management (and they can be) the revenues from these valuable animals might be increased considerably. Fur might be included in the revenues from any managed forest, as well as revenues from recreation and hunting and fishing licenses. And these sources of income may be considerable *when the forest has absolutely no merchantable timber.*

Just how far game fish can be considered a forest product may be debatable. But brook trout, Atlantic and land-locked salmon, and very often small mouthed black bass are absolutely dependent on waters protected by forest growth. Generally every dollar spent in angling for these fish should be included in the gross income for the particular area where the fishing was done.

No discussion of this sort can be at all complete without mentioning forest taxation. Tax relief for the forests has been a subject for endless discussion. Some changes have been made in the last decade or two, but I do not see that alterations in tax laws have produced much change in the attitude of the public toward maintaining forests. Again, in New York, it looks as if we would have to abide by forest taxes as they now are. The report of the Special Joint Committee on Taxation and Retrenchment, State of New York, Legislative Document No. 91, April 1, 1924, is an illuminating pamphlet on forest taxation. On page 56 it draws the following conclusions:

1. The farmers of New York pay more taxes in proportion to their income than any other group.
2. Other rural occupations, including lumbering and logging, mak-

ing paper, etc., pay far less income in taxes than farmers. "These facts would seem to constitute an ample base for the recommendation that no legislation for the amelioration or postponement of tax burdens on forests be enacted until definite proof can be adduced that such action will not result in shifting tax burdens to farming and other already over-burdened agricultural occupations."

The general attitude of the Report seems to favor more study of forest taxation, and an accumulation of more facts before a special taxation policy for forests can be worked out. Perhaps if revenues from other than wood products are developed, present tax laws may be less conducive to destructive lumbering.

In connection with this general problem, the famous "Article VII, Section 7" of the New York State Constitution is of outstanding importance. One of the first forestry discussions I heard, mentioned "opening up" the Adirondack Park. And fifteen years have not changed the arguments. Some technical men advance extreme views. Recknagel's "Forests of New York" was apparently written partially as a plea to amend the constitution. "Conservation Ad Absurdum" by Waugh, in the *Scientific Monthly*, November, 1923, is a scathing denunciation of this constitutional clause. Nearly every forester has cast an occasional stone at this law that prohibits the cutting of mature timber. But in the last couple of years a new note has been sounding. The October, 1924, number of *American Forests and Forest Life*, published an article by L. E. Kneipp, called "Forestry and Recreation" that, though it does not mention New York or her troubles, is a frank statement declaring that, in the future, silviculture will have to be modified to fit into recreation. That a whole recreational policy must be built into forestry, and that the foresters and forest schools must cope with the situation.

The first and almost the only defense of Article VII, Section 7, of the New York Constitution, to come from the pen of a forester, is an article by Marshall, in the February, 1925, *JOURNAL OF FORESTRY*. He may be quite right. With the law as it is, the timber is still there. Perhaps 25 years hence—perhaps even now—we might "open up" the Adirondacks profitably. But if we had opened it up 20 years ago, the land would probably be about like other "opened up" areas. Pinchot was severely criticized for "locking up" Alaskan timber. Maybe it was wrong, but the *timber is still there* and it *still belongs to us*.

Many contend that the Federal Forest Service is cutting timber, and still maintaining recreational advantages. Quite true. But, though I am a frank admirer of the work of the Forest Service, it is well known that it has been operating at a loss, so far as *direct* money returns are concerned. I consider the Forest Service income as the criterion for *direct* financial returns.

There are 158 million acres of National Forests.

The gross income for the fiscal year ending June 30, 1925, was about 5 million dollars. Timber sales were a little under 3 million. Grazing fees were not quite a million and three-quarters, and other incomes make up the rest—some three hundred and thirty-five thousand dollars.

It thus took upwards of 31 acres of National Forest to get one dollar of gross income. It is scarcely necessary to attempt to capitalize the National Forests, or to consider Forest Service expenses to realize that this tremendous governmental undertaking is building for the future rather than for the present, and that indirect rather than direct economic gains are all that this generation can expect. And nearly half of the direct money returns have been from grazing rather than timber sales, if my authorities are correct. I do not deplore this "loss" of the Forest Service. It is far over-balanced by the *indirect* gain. But we do deplore the *direct* loss to the State of New York. Marshall, quoting Recknagel, gives 65 cents an acre as the annual loss. A considerable sum, applied to 2 million acres. But even that is the amount the forfeit is *supposed* to make. Pulling, in the April, 1924, JOURNAL, quoted 20 cents per acre as the amount that *has been made*, approximately, in New Brunswick. The larger figure might apply nearer the bigger markets, and with more elaborate transportation and closer utilization. But the silviculturalist that attempted to get it would have many worries. He could get the 65 cents net profit per acre per annum. He might get more. But if his silviculture was questionable, or if his system—clear cutting for example—was not popular with the public, criticism might result that would be a severe set-back to the profession. I believe the New York public is not so educated that it is interested in silviculture or will let us practice silviculture on public land. But this public *is* interested in camping and fur and fish and game, and will let us, I believe, make the most of these forest products. I believe further that there would be less opposition to amending the constitution if more people knew that solid old growth timber was not the best habitat for

wild life. To me this is one of the best arguments for some cutting in virgin stands.

We may summarize the importance of wild life and recreational uses in forest management with the following conclusions:

1. The business of growing timber pays a low percentage on the investment, and is not attractive to the private owner.

2. Forest utilization includes the recreational, fur, educational and sporting uses, as well as the use of tree products.

3. These forest products, other than tree products, can be given a financial valuation, and may be so managed that what has been a financial loss on a given area may be turned into a profit.

4. The attitude of the profession of forestry has been one of mere toleration relative to sporting and recreational uses of the forests. This attitude must change if forestry is to reach its highest development. These uses must be recognized as even superior to wood production in some areas, where the public interest in wild life and recreation is very great.

5. Forest preserves, such as are in New York, are available for national emergencies. They are available for every use *except* wood. It may be better policy to retain a preserve, uncut, rather than cut in such a way that the result is bad economics, bad silviculture, or even results in the loss of popular favor from the tax-paying public that is still uninformed on technical forestry problems.

6. Recreation and wild life may produce an income as well as pay the taxes on forests at present containing no commercially valuable timber, and thus permit them to be held and improved.

7. Recreation and wild life are popular, where silviculture is little understood. Nearly everyone camps, hunts, fishes, is a bird enthusiast, or has some outdoor hobby. If forestry can be firmly tied to these popular pursuits, silvicultural management may become easier.

8. It may be difficult to apply these uses in forest management, but they are of great economic importance, and the profession of forestry must consider them to get the greatest use from the forest, even where silviculture alone is now paying satisfactory dividends. Though we are primarily considering wild life and recreation as economic aids in silvicultural management, their social and educational value may be such that their economic importance becomes a minor consideration. Forest use should always be translated into terms of human welfare, and the greatest use is not always limited to tree products.

PUBLIC FOREST CONSERVATION AND PRIVATE TIMBER GROWING

By F. W. REED

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These are two distinct things. In mixing them together in a discussion of the question, "Does Forestry Pay?" we succeed mainly in befogging the issue.

It is nowadays commonly accepted that the public welfare demands the conservation of our forest resources, that all of our forest lands be so managed that they will produce continuously the maximum volume of wood for industrial use and furnish also the indirect benefits of watershed protection and recreation. Since by far the greater part of our forest lands are privately owned, discussion of "how to do it" has revolved largely around them. The professional propagandist has inclined to argue that because the private forests should be conserved, it is the duty of the existing owners to do the conserving. To bolster up this stand the tendency has been over strong to hold that it would actually be profitable for the private owner to manage his lands conservatively, to cut them on a sustained yield basis, to make of them a timber growing investment, wherever they may be, or whatever their character. Some of those who have bellowed the loudest for forest conservation have been the slowest to invest their own money in timber growing ventures.

This apparent discrepancy between precept and example serves to emphasize the radical difference between public forest conservation and private timber growing. The forest propagandist, like any other citizen, must invest his capital (if he has any) where it will do him personally the most good in the way of adequate dividends with reasonable safety. A timber growing proposition he must consider strictly on its financial merits, just as he would any one of a hundred other opportunities to invest his money. His belief in his cause, or the fact that public good will accrue from the conservative management of all forest lands, are no justification for him to buy and manage some particular tract at his personal expense. He can do so only if there is sufficient promise of personal profit in dollars and cents.

In short, private timber growing is a business undertaking pure and simple, governed by the same rules of profit and loss as any other business venture. One invests his money in a wheat ranch, an apple orchard, or a dairy farm, not because the public needs a large and sustained yield of such supplies, nor because it is to the public interest that all agricultural lands be kept productive, but simply because he believes that he can sell the grain, fruit, or milk he may raise at a profit to himself. By the same token one should undertake a timber growing project only if he feels sure that he can sell the sawlogs and other products of the land, which he may grow, at prices which will return dividends on the investment. If any public benefit accrues from the conservative management of his forest property, that is purely incidental.

Many farmers have failed in business. Thousands of farms have been abandoned as unprofitable. We are now passing through a period of small profits, or none at all, due to overproduction and allied causes. Such evidence however is not advanced as proof that agriculture as a whole is economically impossible and should be abandoned everywhere. On the other hand, the professional agriculturalist, who is sincerely interested in the general cause of agriculture, and who no doubt would be pleased to see all good agricultural land kept in full productive condition, is not advocating that this be done. He is advising, rather, that farming be restricted to those lands which are physically the most fertile, and are so situated that they can be operated the most economically. For the marginal, or sub-marginal lands, from which agricultural profits are doubtful, or impossible, he is recommending abandonment of the industry.

With our forest lands: many sawmill operators have failed in business; there are many thousands of acres which are not adapted to the profitable growing of timber as a private venture, because the rate of growth is too slow, or the annual carrying charges, interest, taxes, or protection costs, are too high (in other words, there is a large class of marginal or sub-marginal forest lands); we are now passing through a period of small profits in the lumber industry, or none at all, due to overproduction and allied causes. Such evidence is advanced from some quarters as convincing proof that forestry, the growing of timber, as a private venture is nowhere, at no time, under no circumstances, profitable. At the same time, from some quarters where the zeal for the cause of public forest conservation, though most

commendable, is nevertheless a bit misguided, there is still too strong a tendency to disregard such facts, to argue that forestry will pay everywhere, and to hold that the forest owner who fails to go into the business of timber growing is wilfully neglecting his public duty.

The true answer to the question, "Does private forestry pay?" is "Yes, and no." It will pay if one selects the right kind of land and manages it with business efficiency. If one attempts to grow timber on marginal or sub-marginal forest lands, or if his business methods are inefficient, he will fail, along with the hapless farmer under similar circumstances. Whether the public cause of forest conservation will be the gainer or loser has nothing to do with the decision.

Those who might with personal profit engage in the growing of timber divide themselves, broadly, into three classes:

1. The lumberman, who has completed the harvesting of his virgin crop and has on his hands a cut-over area. He may abandon it as worthless; he may sell or develop it for other uses; or it may prove most profitable if he holds it for the growth of a second crop of timber of some sort.

2. A permanent wood using industry which intends to stay in business indefinitely, and must have an assured annual supply of raw material at reasonable prices. It may depend for its wood on the open market; it may purchase and log non-reproductively a succession of forest tracts; or the most profitable method may be to acquire and manage on a sustained yield basis one tract of the proper size and character. (A paper plant is usually cited in illustration, but a lumber company which is laying plans for the operation of a new tract is an equally good example.)

3. Capital which is seeking investment. One of the thousand or more opportunities for putting such money to work is to purchase with it a tract of growing timber, to be held until the crop is mature and then re-sold, or, if circumstances warrant, to be held permanently and managed on a sustained yield basis.

It is the function of the logging engineer to plan and execute ways and means for getting the timber from the stump to the manufacturing plant as economically as possible. It is the function of the manufacturing expert, the sawmill man, the paper mill man, to plan and execute the most efficient methods for converting the raw material in the log or cord to a saleable product. As to the professional forester, it is true of course that the more he knows about utilization and the

markets for all the different species and grades of wood which grow, the better equipped he will be to practice forestry, but after all his primary function is to develop and put into effect such plans for the management of the forest land itself as will return the greatest profit on the investment; to be of aid to the lumberman in solving the problem of his cut-over lands, to assist the permanent wood using industry in making the most practicable provision for an assured supply of raw material, and in helping the capitalist to determine whether an investment in timber growing would be advisable.

If he will approach such problems in the true scientific spirit, with an open mind, and no preconceived prejudices, neither that private timber growing is nowhere practicable, nor that it is his bounden duty to argue every forest owner into the growing of timber, he will gain much credit for himself and his profession. If he will recognize the principle that the public need for wholesale forest conservation does not mean that every forest area which happens now to be privately owned will *ipso facto* grow timber at a profit; if he will recognize that the answer to the question, "Does private forestry pay?" is not a standardized "Yes," but varies with each different tract of land, and must be worked out from a consideration of the facts as they are rather than some propagandist's theory of what they ought to be, he will greatly increase the value of his services to the timberland owners of the country.

It has recently been stated, with much truth, that "most forest owners are as yet scarcely aware that trees grow." An even smaller number have as yet realized that one with a forestry training may have something of value to give them toward the solution of their problems in land and forest management. At first blush, for one who has lived in the midst of the forestry movement for the past 25 years, this situation is incomprehensible. With all the publicity that forestry has had, through the press, from the lecture platform, and by means of the moving picture and radio, it is inconceivable that any man, unless he be illiterate or deaf, has failed to learn that there is such a thing, and that it is good. With all the haloes that have been drawn around the self-devoted head of the professional forester, with all the pictures that have been painted of him as a patriotic, self-sacrificing public servant who is striving so nobly to save the nation its birthright, it is inexplicable that the roughest necked lumberman, and the hardest headed financier, does not kneel down in worshipful adora-

tion to gather and cherish the pearls that drop from the sanctified lips.

Perhaps the explanation lies in the charge of criminal negligence, a perverted disregard of the truth, and a wilful obstinacy that leads such men to stand in their own light. If however one analyzes the kind of forest propaganda that has come to the eyes and ears of the average citizen, and contemplates the activities of the average professional forester, he who looms largest in the public eye, perhaps there is a more logical explanation of the situation.

Our forest propaganda has been based on the "awful story of forest destruction," of the rapid exhaustion of our timber resources through over-cutting, reckless burning, and general all round abuse, and of the public harm which will accrue from the impending timber famine and the denudation of our watersheds. Those remedial measures which have been advocated and put into effect have been mostly along the lines of public ownership and governmental regulation. The ability of trees to grow has been mentioned mainly to emphasize the interminable period which must elapse, after the "ruthless lumberman and the demon fire" have done their "devilish work," before a new forest can become established. The professional foresters as a class, at least those who have stood most in the limelight as leaders of the forestry movement, have been interested primarily in the cause of public forest conservation; when they have discussed with the private timberland owner the introduction of conservative methods of cutting, and fire prevention, they have argued from the standpoint of the public duty he owes, and of the public need, rather than from the standpoint of his own personal interest and profit.

The average citizen therefore, from the sort of propaganda fed him, is too apt to think that forestry is something involving public ownership, or governmental regulation of private business, rather than something that might be used with profit in the management of a private timber property. He is too apt to think that a professional forester is a man who is active in the spread of the gospel of conservation, more at home on the lecture platform than in the woods, and it does not occur to him that such a man would have anything of value to give toward planning the management of his forest lands. Even among those comparatively few timber men who have realized that maybe there is something in this timber growing proposition and who want to figure on its possibilities, there is a tendency to rely on the knowledge

and advice of some practical woodsman rather than a trained professional forester.

There is no intention here to minimize the splendid efforts that have been made in the cause of forest conservation, nor the splendid results in the shape of millions of acres of Federal and State forests, of fire protective organizations which already in some sections have reduced the fire risk to that point where it no longer is a serious obstacle to the growing of timber, nor of a hundred and one other marks of progress. There is no desire either to belittle the start that has been made in various localities in the introduction of timber growing principles into the management of private properties. It is good, and there is every promise that it will steadily get better, because of the efforts the leading schools are making to train their students for this line of work, and because each year an increasing number of forest school graduates are going out to make a place for themselves in the business world.

It does seem important, however, at this time, to emphasize that the professional forester who would see more progress in private timber growing, and would play his part, must be ready to recognize this purely business proposition as something entirely different from the public cause of forest conservation. He should be willing to admit that the public good and private interest are not always compatible, and that the public has no more right to demand of a forest owner that he grow timber at a loss than to ask the farmer or the automobile manufacturer that they supply the market with their products at a price below the cost of production. In advising with a forest owner as to the best management of his property, he should be ready for the time being to forget the public cause of forest conservation, and to recommend the growing of timber, not because the public would thereby benefit, but solely if, when, and where, the practical facts in the case point strongly to management as the most profitable method of treatment.

THE STUDY OF NATURAL REPRODUCTION ON BURNED FOREST AREAS

By J. A. LARSEN

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It is not necessary herein to quote statistics on the areas and values of timberland destroyed each year in the United States. The losses are sufficiently large to attract attention and to present problems in forest management as well as in forest research. The situation is here and every forester must meet it, be he manager or investigator. This paper is an attempt to present the problems of the investigator whose job is to furnish certain information on reproduction of burned over forest land to the forest manager.

The questions which the forest investigator must answer are: How soon will the forest come back after the fire? What species will be coming? When and how will they come? What factors contribute toward a hasty regeneration and what are the reasons for the delay? Will the land again support the trees which grew there before the burn? Are all of the factors and conditions which affect the natural restocking after fires discernible and reducible to certain principles and laws which may be of assistance in shaping the policies of management?

While it is well known that natural restocking will take place promptly on most forest land burned once in western United States, nobody can satisfactorily explain occasional failures or give reasons why one species has succeeded in place of another, and far be it from anybody to venture to predict what the reproduction will be after this or that recent fire.

It was while studying natural regeneration on many of the larger burns in the Bitterroot Mountains that the author began to formulate certain theories and postulate certain hypotheses which would serve as methods of attack in solving these problems, or at least, give him a closer understanding of the subject. In the course of these studies it became evident from the start that every silvical characteristic of

the species, every factor of site, be it climatic, physiographic or edaphic, and every condition surrounding the fire itself, exerts itself in some way or other during this regeneration period. Furthermore, that these various factors or conditions have a definite time during which they occupy the stage or play their leading parts: Some remain potent or in force throughout the entire period, that is, both before, during and after the fire; others are operative previous to the fire only; a third set of factors are of importance only as they function during the fire itself; and a fourth set of factors and conditions begin to operate as soon as the ashes are cold and continue their influences until the new stand is well established. Let us look at these matters a little closer.

In the set of factors or conditions which operate both before and after the fire must be placed those which remain constant for the region, fires or no fires. These will fall on the climatic and physiographic group; general weather conditions including sunshine, air temperature, precipitation, relative humidity and wind movement from year to year and month to month. Also major topographic features of general elevation, aspect, gradient, and to some extent certain structural and chemical soil qualities which the fire is powerless to change. These general climatic, topographic and edaphic features serve to create conditions in one forest region which set it off from any other region. They are of local significance or influence as factors in determining the forest types or species which grow on any one slope, elevation or aspect, and they remain immutable by any number of forest fires.

In the second group are those conditions existing before the fire only. These discontinue altogether as positive or negative influences after the fire has ceased. They are age, composition, and density of the forest which burned and the amount of inflammable material on the ground.

The age of the stand destroyed plays no mean part in the restocking inasmuch as there is in young stands very little seed available for immediate restocking either on the trees or on the ground. In certain cases natural reproduction fails also because the previous forest was altogether too old for sufficient seeding.

From the standpoint of composition it is necessary to observe that like follows like and in very few cases does the second forest springing up after the fire contain species which did not exist in the locality before the fire. The composition of the forest may materially influence the rate of spread or the intensity of the flames and consequently the

degree of destruction wrought. The same may be said regarding density.

The amount of inflammable material on the ground, such as dead wood, grass, brush, litter and duff, are of importance since these intensify the heat and increase the damage to the stand itself, the seed which may be on the ground and to the soil itself. The effect is also to prepare the ground for the new seed and seedlings and to eliminate competition from certain vegetation.

In this class are also placed the local conditions of precipitation, air temperature, atmospheric humidity and soil moisture conditions preceding the fire, all of which affect the inflammability of the trees or the material on the forest floor. Furthermore, the exact time within the growing season at which the fire occurs must be known and carefully noted, it being recognized that fires burning early in the season are less destructive than those happening later on, and that these early fires are not followed by nearly as good reproduction as those of later origin. This is mainly a matter of seed ripening, for restocking does take place by seed which is on the trees at the time of the fire. There is the possibility, of course, that the early fire may leave many seed trees in such a condition that the seed continues to ripen. Another matter not to be overlooked in this connection is that of seed-year or off seed-year during the summer of the fire, and what species bore seed and what not. In many instances a complete change in the mixtures or composition of the new stand from that of the old can be explained on this basis only.

The investigator soon learns to differentiate between fires which occur on logged land and those burning in uncut or unexploited stands. In the latter case the main body of the flames and therefore the greatest heat and destruction is in the crowns of the trees, and though the duff burns, there is usually moisture in the soil underneath where some seed lies buried. On this account the deeply covered seed under a burning stand of timber often escapes destruction. On the logged over land on the other hand, the main body of the flames is concentrated near the ground and close to where the seed is buried. The ground and the duff on logged areas have, moreover, been exposed to wind and sun for a period of time, and have therefore become much more inflammable than the duff resting underneath the standing trees. For these reasons logged areas when burned, restock much less abundantly than areas supporting standing green timber.

Among the factors or conditions operating or existing only at the time of the fire are the local climatic or unusual atmospheric conditions, temperature, humidity and wind movement which cause the fires to spread rapidly, acquire greater consuming power and destructive proportions than would have been the case had the local weather conditions been less extreme or accentuated. Under such conditions the fire will not only cover a very large area, but will eat further into the less inflammable stands than would otherwise have been the case. In not a few instances the fire will of itself give rise to wind movements of unusual or remarkable proportions. These winds uproot and destroy trees that would have remained standing to become prolific seedbearers.

The conditions existing at the time of the fire, therefore, which are chiefly of a local climatic nature, in a large measure influence the degree of destruction of the stand as well as that of the seed and seed trees.

By far the most effective factors for success or failure in natural reproduction after fires are increased air and soil temperature, intensified insolation, frost, evaporation and soil dessication. In addition to these are invasion of competing vegetation or the absence of its protecting, sheltering, and soil building qualities. To these must be added insect and fungous activities attributable to the fire and in not a few instances prolonged denudation, soil deterioration and erosion, all of which either curtail seed production, retard germination or reduce the survival of seedlings. It is in this phase of the subject that we recognize natural selection as it operates in forest succession, and those seedlings found to survive all of these superimposed conditions are of species structurally and physiologically able to withstand and survive the environmental conditions. Therefore, the more uniform the site following the burn the purer will be the new forest, and only where the exposed terrain presents diversified local conditions of moisture and shade will a mixed forest follow, the mixture then being chiefly group-wise according to high or low site or exposed or protected localities. The more exposed or critical the site after the fire the greater will be the proportion of xerophytic species and the more open the new stand.

The most remarkable thing about the natural regeneration of burned evergreen forests is the uniform density and distribution with which it covers the land even in cases where all of the mother trees are killed. There is very little evidence of seeding in from the adjacent

green timber afterwards. How may one explain this? It is again necessary to postulate certain causes and say that the seed must have come by one or more of the following methods: (1) distributed by the wind through the air or over the snow for long distance subsequent to the fire; (2) brought in by birds or rodents subsequent to the fire; (3) released from the very trees which burned soon afterwards and on the very same land and location; (4) deeply buried in the duff or in the top soil and thus escaping destruction by the surface fire; (5) carried in by the wind for relatively short distances from adjacent live stands or scattered by individual trees which lived on the burn for a year or two and produced seed; (6) released from the trees at the time of the fire itself and carried upward in the general vortex to be distributed soon after on the ashes.

While the author does not deny that seeding after the manner given in points 1 and 2 takes place, it is at best sporadic and irregular and utterly inadequate to engender the profuse and uniform natural reproduction witnessed on these burns. The first two methods are discarded as untenable hypotheses and we must look to the remaining hypotheses for a possible explanation.

3. The seed could be released from trees which were killed or partly burned by the identical fire. This matter is fairly easy to prove by prompt examination of the burned stand, the cones thereon, their state of preservation and the character of the subsequent reproduction. Evidence may be materially strengthened by observing what reproduction follows burned timber which was totally destroyed, where every particle of green foliage and cones were completely burned, and what reproduction follows partially burned stands, or stands which were too young to produce seed when burned. The author has consistently found more profuse and more abundant seeding after destruction of mature timber than after very young forests, and it is his conviction that as much or more restocking occurs in this manner as from buried seed.

4. Seed could have been deeply buried by mice and other rodents, thus escaping destruction by the ordinary surface burning which accompanies our usual western crown fires. To prove this point is a little more time consuming, but by prompt and close examination of the stand soon after the fire, by installation of permanent quadrats, mainly of three kinds but of parallel arrangement, one set open and undisturbed, a second screened to prevent subsequent seeding and a third having all duff or other material which might bear seed removed suffi-

cient evidence may be gathered. The data of field studies indicate unmistakably that restocking takes place in this manner but to what extent varies greatly according to species and site conditions subsequent to the fire.

5. The seed could have been carried in by wind for short distances from adjacent live trees or from certain trees on the burn which remained green and bore seed for a year or two subsequent to the fire. This is a common origin. To prove or disprove this hypothesis it is necessary to observe carefully the distribution of the new seedlings in relation to the parent trees both in the point of species and degree of stocking at given distances from such parent trees. Such lateral seeding usually shows progressive steps. The data may be obtained by age counts and distribution maps of the new stock. One should study this progression by permanent quadrats as well as by seed traps. That seeding takes place in this manner is undeniable, but it is confined to relatively narrow strips from 5 to 10 chains wide bordering the green timber.

6. Still another much less plausible origin, but not entirely impossible, is the release of seed from cones during the heat of the fire. Some of this seed may be shed over the burned or unburned ground while the fire is still in progress, some may be carried upward by strong vertical currents of the heated air, smoke and flames and distributed at considerable distance from the active area of the fire. Obviously seeding in this fashion can take place only when there is ripe or nearly ripe seed available in the cones. Seeding by this means has not been proven but it is known that small unburned twigs are thus distributed for miles and these are heavier than the seed, so why is this impossible in the case of seed. Ranger Haun residing at Haugan, Montana, during the 1910 conflagration told the author that pieces of tin from a burning barn were picked up later at a distance of six miles to the leeward. It has been stated on good authority that during this same fire green cedar twigs fell on the streets of Missoula and that the cedar and the fire which carried these into the air were fully 30 miles to the west. To date, it is merely speculation how much seeding occurs by this agency.

RELATIVE ACCURACY OF CALIPERS AND DIAMETER TAPE IN MEASURING DOUGLAS FIR TREES

By RICHARD E. McARDLE

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The object of this study was to determine (1) the relative consistency in measurements made with calipers and with the diameter tape, and (2) if any appreciable difference exists between diameter measurements made with these two instruments. The more important results of the investigation are here summarized.

Two hundred Douglas fir trees were tagged at breast height with numbered tags. This made it possible to measure and remeasure each tree at exactly the same place using the numbers as a check to make sure that every tree was measured. In diameter these trees varied from three inches to thirty-six inches, 40 per cent of the total number of trees falling between three and twelve inches, 50 per cent between twelve and twenty-four inches, and 10 per cent from twenty-four to thirty-six inches. The possible errors due to the "personal equation" were eliminated as far as possible by using a large number of trees and by standardizing the methods of measurement. The same two men made all the measurements for this experiment. Comparison is made in terms of basal areas corresponding to the diameters measured, as basal areas are more closely correlated with volume than are diameters.

The first point to be discussed has to do with the consistency of measurement. This is, how nearly repeated measurements of the same trees will tend to be equal when made by the same or by different men. These two hundred trees were measured eight times, four times with the tape and four times with the calipers, reading the diameters to the nearest inch. Averaging the results of these measurements shows that:

	<i>Diameter Tape</i>	<i>Calipers</i>
	<i>Per cent of Total Basal Area</i>	
Each man fails to check himself by.....	0.62	1.01
One man fails to check another by.....	0.005	1.06

The tagged trees were again measured eight times, as before, but taking the measurements to tenth-inches. The caliper measurement of each tree was an average of two measurements made at right angles and in a uniform manner for all measurements. Averaging these results gives the following:

Diameter Tape Calipers
Per cent of Total Basal Area

Each man fails to check himself by.....	0.42	0.51
One man fails to check another by.....	.09	1.40

From this it appears that there is no significant difference between the tape and calipers as far as checking one's own measurements is concerned. Reading either to the nearest inch or to tenth-inches, a check can be made to within one per cent of the first measurement. But when one man tries to check the measurements made by another man, it is quite apparent that he can do so with far more accuracy by using the diameter tape than is possible with the calipers. With the tape, even if measuring only to the nearest inch of diameter, one man's measurements are almost identical with those made by another. Using the calipers there is a difference of over one per cent. Even with the point of measurement not marked on the trees it was found by measuring and remeasuring three one-half acre sample plots that (with the calipers) one man could check his own measurements to about one half of one per cent, but could not check those made by other men by from one to over three per cent.

To further test the consistency in measurement obtainable with each instrument, there was computed the deviation of the total basal area obtained at each measurement from the average of all measurements with each instrument. With diameters taken to the nearest inch the average deviation of tape measurements from the average (of all tape measurements to the nearest inch) was 0.2; the average deviation of caliper measurements (from the average of all caliper measurements to the nearest inch) was 1.4. With diameters read to tenth-inches, the average tape deviation was 0.2; of the calipers, 1.3.

Thus far comparisons have been made of the total basal areas of the two hundred trees. Theoretically the differences between these totals should be small because errors made in measuring diameters tend to be compensating. That is, at the first measurement, a tree which may be called ten inches is eleven inches at the second measurement, and this discrepancy is offset by an eleven inch tree of the first

measurement being remeasured as ten inches. In this way there is an eleven inch tree and a ten inch tree at each measurement and the total basal areas remain unchanged. A comparison, however, of the total number of trees in each diameter class at one measurement with the number of trees in each class at the remeasurement shows that, with the tape, each man has an average total of 18 trees which were placed at the remeasurement in diameter classes greater or smaller than at the first measurement. With calipers this number is increased to 39. If the comparison is made between the measurements of two men, it is found that with the tape these men check exactly except for 14 trees; with the calipers, to 29 trees. In either case, using the calipers results in twice the number of variations as are obtained with the tape. So that, all things considered, there is good reason to believe that the diameter tape yields results more consistent than do the calipers.

Considering now the difference between measurements made with the two instruments, it was found that the tape invariably yields higher results than are obtained with calipers. Comparing the average of four series of measurements of 200 trees made with calipers to the nearest inch of diameter with a similar average obtained with the tape, the tape gives results 1.5 per cent greater than those obtained with the calipers. Another series of four measurements with each instrument, but with the diameters read to tenth-inches, showed the tape to be productive of results averaging 1.4 per cent higher than the caliper measurements.

This discrepancy between measurements made with the two instruments is an average difference for all diameter classes from three to thirty-six inches. It should be apparent that the difference will be small when measuring trees of small diameter and that as the size of the trees increases, the discrepancy between measurements also will increase. This is because the principle of the diameter tape is based on the measurement of the perimeter of a circle and any departure from the true circular form will increase the ratio between circumference and area according to the amount of departure from the circular form. For this reason, irregularly shaped trees if measured with the tape will have larger diameters than would be obtained by averaging two diameter measurements with the calipers. In general, large trees are more irregularly shaped than small trees, hence the tendency for the difference between tape measurements and caliper measurements to

increase with increase in the size of the trees. The following table, read from a curve based on four series of caliper measurements and four series of diameter tape measurements (both to tenth-inches), a total of 1,600 measurements on 200 tagged trees, illustrates this increase in difference between the two instruments with increase in size of trees.

DBH (Inches)	No. Measurements	Excess of Diameter Tape Over Calipers (% of Basal Area)	
		(Actual)	(Curved)
0			0.0
1			0.1
2			0.2
3			0.5
4	16	1	0.8
5	24	0	1.0
6	72	2	1.2
7	80	0	1.3
8	128	1	1.4
9	136	2	1.4
10	80	1	1.5
11	72	2	1.5
12	112	2	1.5
13	96	2	1.5
14	72	1	1.5
15	64	1	1.5
16	32	0	1.5
17	96	2	1.5
18	80	1	1.5
19	48	1	1.5
20	64	0	1.5
21	96	2	1.5
22	48	1	1.5
23	32	1	1.5
24	8	1	1.5
25	32	2	1.6
26	32	0	1.7
27	16	1	1.9
28	16	2	2.2
29	...	..	2.4
30	...	..	2.7
31	8	4	3.0
32	8	4	3.3
33	8	3	3.7
34	...	..	4.0
35	16	5	4.4
36	8	2	4.8
Total.....	1600	47	
Average.....	.....	1.5	

These conclusions are not, as might appear, inconsistent with the data presented by Behre.¹ The relatively small differences between tape and caliper measurements as shown in his data very probably are due to the small size of the trees studied as well as to differences in the two species studied. Even so, there are indications of an increase in the error between the two instruments with an increase in diameter.

As an item of interest a record was kept of the time required for the different methods of measurement. These are averaged below. There was very little variation from the averages.

	<i>Time Required in Minutes</i>	
	<i>By Diameter Tape</i>	<i>By Calipers</i>
200 trees to tenth-inches.....	65	64
200 trees to nearest inch.....	65	30

CONCLUSIONS

1. The tape is more consistent, and should be used where the *differences* between two measurements of the same trees are of importance, as in measuring permanent sample plots.

2. It is known that calipers are more accurate and the tape gives an over-estimate. The amount of this over-estimate is not important with small timber but might be material in the case of large. Calipers are therefore preferable in measuring large trees where absolute rather than relative accuracy is important.

¹Behre, C. Edward: Comparison of Diameter Tape and Calipers in Measurements in Second Growth Spruce.

REVIEW OF THE CASE OF DIAMETER TAPE VS CALIPERS

By W. M. ROBERTSON

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There has been much time devoted to the study of the relative value of calipers and diameter tape. Although there is little doubt that the difference in the results in any one direction is not great, it is of such nature as would be of importance in the research investigations requiring periodical remeasurement of stands. This concern is centered in the difference in volume between periods rather than in very close approximation to the true volume. The instrument which is consistent in results, even although results be too high or too low, is to be preferred to the instrument resulting in measurements at one time low, the next high. Further, since in general plots will not be remeasured by the man who establishes them, the effect of personal element is another factor for consideration.

Herman Krauch, in the JOURNAL OF FORESTRY, May, 1924, page 537, states that as the tape covers the total circumference of the bole, it actually measures the total growth whether uniformly put on or not, but the calipers indicate growth only between two points at a time, hence "it is, therefore obvious that the diameter tape should always be used when absolute accuracy is desired." He argues, however, that the tape is slower in use, which argument is borne out by experience. MacArdle in a later article has shown that where two measurements of the calipers are averaged there is no difference in the time required for measurement with calipers or tape. Further, Behre found it necessary to make four measurements with calipers in many cases, in which he found the tape is the more rapid instrument. Krauch concludes his discussion by stating that the calipers are to be preferred. In commenting, McCarthy argues in favor of the calipers because of speed and less liability to error. M. D. Chaturvedi shows that there is greater liability of error with the calipers. There is, however, greater liability to misread the scale on the tape than on the calipers.

In the JOURNAL OF FORESTRY of February, 1926, page 178, Behre reports results of his investigation and concludes that there is no significant difference in the two instruments.

M. D. Chaturvedi, in "Measurements of the Cubical Contents of Forest Crops," Oxford Forestry Memoirs No. 4, 1926, has devoted seventeen pages to the discussion of the relative value of these two instruments. His discussion may be briefly stated as follows:

ERRORS INVOLVED IN TAPE MEASUREMENTS

Due to elliptical cross section of the stem, the error involved in the assumption that an elliptical section is circular is always in the positive direction, therefore girth measurements are apt to give too high results for the basal area.

In actual practice when diameter measurements are adopted, the area of the ellipse is not calculated by the formula πab , but either of the following formulæ is employed:

$$(1) \pi (a+b)^2/2 \text{ or } (2) \pi (a^2+b^2)/2.$$

His comparison of results establishes that the claim of higher accuracy for the diameter formulæ than is attainable in the girth formula is entirely unfounded. In fact, the reverse is the case.

A table is given showing the percentage errors in girth and in basal area corresponding to a range of 4 to 20 degree error in displacement of the tape from the horizontal. It is noteworthy that it takes 9 degrees displacement before the error reaches 1.2 per cent.

ERRORS INVOLVED IN CALIPER MEASUREMENTS

Errors in Orientation of the Major Axis.

If the two diameter measurements are not taken at the major and minor axis, results will be too small.

The maximum error due to a variation of the angle between two diameters from a right angle is introduced by measuring the two diameters at an angle of 45 degrees, resulting in an error of —5.9 per cent.

"It is now apparent that the errors introduced are of such a magnitude as to render caliper measurements somewhat unreliable. The accuracy claimed for basal area calculations from diameters is therefore not justified from a theoretical principle."

The section on errors of the instrument deals with both the errors resulting from the instrument being out of adjustment (the author points out that it is almost impossible to adjust the sliding arm so that it is at right angles to the scale and still have an easy movement on the scale of the moveable arm) and from wrong use of the instrument. He discusses deviation of a moveable arm from the true perpendicular; errors from not having the scale of the calipers in contact with the tree; errors introduced from the deviation of the line of contact from the horizontal plane of the tree; and errors in the formulæ employed in the compilation of the basal area.

His conclusions are that caliper measurements are subject to various errors arising from a number of causes which can only be controlled by taking very great pains, and some of them can never be entirely eliminated. It is easier to standardize the errors of the tape which are always in the positive direction. It is simpler and more rapid in practice; there are no errors in the tape corresponding to the angle of error in the calipers. The error of normal horizontality is only about half that of the calipers. The security of girth measurements lies in the uniform direction of its errors which can be systematized for successive measurements.

"Relative Accuracy of Calipers and Diameter Tape in Measuring Douglas Fir Trees" is the title of an article prepared by Richard E. McArdle, Pacific Northwest Forest Experiment Station. The object of the study was to determine the relative consistency and accuracy of the instruments and, if any appreciable difference exists in the results.

Two hundred trees from 3 to 36 inches were tagged and measured eight times each by two men. Comparisons were made in terms of basal area. He found no significant difference between calipers and tape as far as one man checking his own measurements is concerned; but use of tape results in much the greater accuracy when one man checks another's measurements. The deviation was 0.2 with tape, 1.3 with calipers. In four hundred measurements, tape results were 1.5 per cent higher than calipers. Measurement of 200 trees to one-tenth inch by both instruments required no difference in time. The conclusion is that the tape is more consistent and should be used where the differences between two measurements are of importance. The tape may give an over-estimate, but this is not important in small

timber. Calipers are to be preferred in measuring large timber where absolute rather than relative accuracy is important.

R. H. Candy, Dominion Forest Service, made a study of this problem to determine the relative accuracy of the two instruments; the dispersion in the measurements; the personal factor in their use. Twenty-one marked trees were measured one hundred times each with each instrument by two experienced men. Results were subjected to statistical analysis. The tape was almost consistently higher in results. The range of dispersion in the measurement of ten trees one hundred times by (A) with calipers was 0.16", with tape 0.11". (B) with calipers 0.14", with tape 0.11". The average difference between the measurements of A and B with calipers was 0.05"; with tape 0.005". Hence when the diameter growth in a five year period is one-half inch, the calipers introduce an error (in the average) of ten per cent, the tape only one per cent.

His conclusions are that the tape measurements are uniformly higher, that the range of dispersion is greater with the calipers than with the tape; that the difference in the measurement by two men is greater with the calipers than with the tape. Hence the tape should be used for all permanent sample plot work.

THE REDWOODS; WHAT FACTORS HAVE FAVORED OR
RETARDED THE PRIVATE PRACTICE OF FORESTRY
IN THE DOUGLAS FIR AND THE WHITE PINE
REGIONS BY COMPARISON WITH THE
REDWOOD REGION*

By DAVID T. MASON

Forest Engineer, Mason and Stevens

Yesterday we listened to a number of papers on the private forestry situation. In these papers we found optimism, pessimism, and fatalism. Being an optimist myself, I was greatly impressed by Dr. Wilbur's inspiring address, pointing out as it did the future needs for wood and the consequent importance and the opportunities of our branch of chlorophyll engineering. The practice of fatalism is a comfortable method of letting things go their own way, but personally I would rather put some harness on fate and drive her more promptly to the point where we shall find really satisfactory practice of forestry on American timberlands.

Yesterday we seemed fairly well agreed that over production here in the West is seriously hampering forestry practice in the East. What we do with our western forests is, as Col. Graves suggested yesterday, a national as well as a local problem. Since the scene of operations in the West is more than 90 per cent on private lands, western private forest management is a national problem.

As one of an extremely small number of consulting foresters here in the West whose bread and butter is dependent upon the private practice of forestry, I have been asked to tell you what things in my judgment have favored or retarded the private practice of forestry in certain western regions. Necessarily I must speak from my own experience, and if my statement is to be of the slightest use it must be reasonably frank, even at the risk of being offensively egotistical.

Apparently it is rather generally recognized that private forestry began *earlier* and has been adopted as a policy by a *higher proportion* of the operators in the redwood region than in the Douglas fir or white

* Presented at annual meeting, Society of American Foresters, San Francisco, December 17, 1927.

pine regions. Is this sheer accident, or are there underlying reasons? If there are reasons we may possibly be able to learn from them how the expansion of private forestry may be stimulated or retarded. I am convinced that definite causes and not accident are responsible for the relative development of private forestry in the three regions.

The factors affecting the adoption of a forestry policy by private owners may be split into two classes:

1. The physical factors—upon which the forester bases his judgment as to the practicability of forestry; and
2. The psychological factors—upon which the private owner bases his decision.

PHYSICAL FACTORS

I shall list the principal physical factors, with in indication of my judgment for each as to whether it is relatively favorable or unfavorable to the private practice of forestry in the different forest regions.

<i>Regions</i>	<i>Redwood</i>	<i>Douglas Fir</i>	<i>Idaho White Pine</i>
1. Yield capacity	Favorable	Intermediate	Unfavorable
2. Value of product (Species and accessibility considered)	Favorable	Intermediate	Unfavorable
3. Cost of protection (Fire, insects and disease)	Favorable	Favorable	Unfavorable
4. Cost of reproduction	Unfavorable	Intermediate	Favorable
5. Cost of Taxation	(Equal when redwood operators adopted forestry)		
6. Availability of second growth and public timber to supplement private old growth timber	Unfavorable	Favorable	Intermediate
7. Length of cutting cycle and adaptibility to selective cutting	Intermediate	Unfavorable	Favorable

The various factors above vary considerably in importance; when they are properly weighed, and when the proper value for each factor in each region is determined, it appears to me that there is no very great difference between the different regions as to the practicability of private forestry, speaking broadly for the different regions. Of course there are very great differences within any given region as to practicability on specific properties.

PSYCHOLOGICAL FACTORS

The psychological factors, upon which the owner has based his decision have been, *up to this time*, far more important than the physical factors in their effect upon the adoption of private forestry practice in the different regions. Some of these factors are indicated below.

<i>Regions</i>	<i>Redwood</i>	<i>Douglas Fir</i>	<i>Idaho White Pine</i>
1. Industrial prosperity	Favorable	Unfavorable	Unfavorable
2. Pressure for early liquidation of timber	Favorable	Unfavorable	Intermediate
3. One or more leading lumber men favorably disposed	Favorable	Unfavorable	Unfavorable
4. Public sentiment insistent upon forestry	Favorable	Unfavorable	Unfavorable
5. The Myth "Forestry is a Public Function"	Favorable	Unfavorable	Unfavorable
6. Foresters advice to owners. (The forester's belief in private forestry, his belief in himself, and the owner's confidence in the forester.)	Favorable	Unfavorable	Unfavorable
7. Co-operation between foresters	Favorable	Unfavorable	Unfavorable

Up to this point this paper is an outline of my personal impressions of the causes of what has happened and the promptness with which it has happened in the several regions. I wish to take up further some of the psychological factors which are more or less interrelated.

I have heard it said that one trouble with religion today is that many ministers do not more than half believe what they preach. Certainly we cannot expect to make much progress in stimulating private forestry if we are not thoroughly sold on it ourselves, and in addition have the courage to stand up for our convictions. Unfortunately all too many in our profession have long been suffering from an extremely severe inferiority complex evidenced by the rather general belief now rapidly passing away—that "forestry is a public function." This belief denies that timber growing is a real business. Another evidence of the inferiority complex is the idea that "forestry is 90 per cent fire protection." Of course fire protection is fundamental all the time, but only in the infantile stages can it be considered as 90 per cent of the job. Let us get along toward the grownup stage where other

matters assume importance. If a military force or a football team spent 90 per cent of its energy developing the defensive there would be small chance of winning. As foresters we must develop our offensive, and work to win.

We can remove the effect of pressure for early liquidation of timber, and we can restore industrial prosperity by the broad application of sustained yield forest management.

During the past year especially I have been working to develop and promote a plan to bring soon the wide application of forestry practice on private land. Knowing somewhat, at least, my own limitations I have sought through hundreds of letters and personal talks the advice and interest of leaders in forestry, lumbering, timber investment, banking, railroad, legal, scientific, economic and other fields, to assist in securing a correct statement of facts and principles and to assist in putting the plan into effect. This plan to make widely applied sustained yield forest management solve our principal forest problems has in it nothing new, unless it be the bringing of various statistics up to date, and the bringing of a lot of known facts and principles together in a fresh arrangement and method of presentation.

Kirkland used the sustained yield idea in an able article published ten years ago; it did not receive from the profession or from the industry the attention that it deserved.

As a forester I am unhappy to state that, in the formulation and promotion of this sustained yield plan, I have found that foresters in general and on the average have shown less interest than any other class. Most foresters (but with notable exceptions) have apparently regarded the plan as something purely academic—a piece of forestry literature of more or less interest, rather than something to be used energetically to solve important problems. This plan, based upon and approved by the judgment of many men, offers great possibilities for the stimulation of the practice of forestry on both private and public lands.

Is it not possible to secure some active interest in this plan on the part of the majority of foresters? Some interest, either for or against, would be encouraging. If the plan is no good, let's say so and be done with it; if it has some merit, but not enough, let us join in working it into better shape; if it will do as it is, let us join in putting it into effect. Of course I am convinced that the plan is sound as it is, but I am willing and anxious to co-operate with anyone and

everyone to make it better ; or, if there is a better plan I am willing and anxious to co-operate with anyone and everyone in putting that into effect.

Yesterday Col. Graves suggested the need for national action to cure over production, which is most critical in the West. Although I agree that we need national action, I do not know what he had in mind as a remedy to be applied by the nation. I wish to suggest that national action might well take the form of devoting the federal timber to the promotion of the sustained yield plan.

With reference to future progress of forestry on private lands in the West I venture to predict that within a few years the financial advantages of selective cutting will force its wide adoption bringing with it forestry as a by-product. Furthermore, the sustained yield plan is making satisfactory progress, and I expect to see it adopted widely.

I would like to see a lot more foresters co-operate in promoting both selective cutting and the sustained yield plan, especially in order that we may get results sooner and also in order that the profession may have a more prominent part in securing the results.

As you see, I am a hopeless optimist, and I believe that we are going to have more faith in our profession, that we shall more generally have courage in our convictions, that we are going to co-operate more effectively, and that as a result we are about to see a rapid extension of private forestry practice in our western forest regions.

THE WATER CYCLE

A DISCUSSION OF THEORETICAL CONSIDERATIONS AND THE POINT AT
WHICH PRACTICAL APPLICATION MAY BE MADE*

By W. C. LOWDERMILK

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THE MAIN FEATURES OF THE PROBLEM

1. *Theoretical:* A minor part of the rain on land areas of the earth's surface consists of moisture blown by winds directly from the oceans. We have a measure of this portion. It is the discharge of the rivers back into the ocean. It is apparent for the earth's land surface throughout a long period of time that the discharge of rivers into the ocean must approximate the landward blow of moisture from the ocean. For, if the discharge were less, excessive quantities of water would accumulate in and waterlog the land surface: and if the discharge were more the land area would be deprived of moisture supplies until they equaled the amount solely derived from the ocean direct. The escape of water by other ways to the ocean have been considered but it seems probable they comprise a negligible portion of the river discharges. The discharge of the world's rivers has been calculated by meteorologists to be between 20 and 30 per cent of the precipitation on the land area. Therefore about one-fourth of the earth's precipitation comes directly from the oceans; the remaining three-fourths comes from moisture reëvaporated from the land area. This latter supply represents direct evaporation from wetted surfaces and from transpiration of vegetation.

Rainfall on land is accordingly made up of two evaporation-precipitation cycles; namely an ocean-land evaporation-precipitation and a land evaporation-precipitation cycle. The part which these two cycles play in the rain, varies from the shore line inland. Where moisture laden ocean winds enter as cyclonic lows upon the land, the rain is

* Presented at the annual meeting of the Society of American Foresters, San Francisco, December 16, 1927.

made up almost entirely from ocean derived moisture; but as the whirling cyclonic winds penetrate farther inland the ratio is reversed until practically all the rain is derived from land evaporation. And in enclosed basins the rainfall approximates the net evaporation from the basin land surface. Slight fluctuations may occur in such basins as is evidenced by the changing levels of inland lakes without outlet, but the general relation holds.

This is a summary statement of the case which appears to be true when the entire precipitation on the land area is considered; the same relations do not hold to the same extent for small watersheds where topographic and other features and conditions may influence the ratios. A simple formula may be used to express these relations, where both precipitation and run-off are expressed in the same units as depths.

$$R = P - E \qquad E = P - R$$

Where P is precipitation, R is run-off and E is evaporation.

It is obvious that man can have no control over the moisture blown by cyclonic winds from the ocean onto the land area. There is left, however, the land evaporation-precipitation cycle supplying the major portion of the rain in the interior of large continents which may be subject to some alteration, a measure of which has not yet been determined.

II. *Application*: Following this general statement of the water cycles, it is desired to consider the point of the cycle where measures of control may be exercised. This point is the zone of impact of the rain upon the land surface however covered by vegetation. It is the division of the falling rain into immediate surface flow or so-called run-off and seepage that is of primary interest to us. What happens when rain strikes the ground? What are the factors which determine its fate as immediate surface flow or seepage? This question must be considered independently of floods: For floods are the resultants of a number of factors only one of which may or may not be the incomplete absorption of the rain as it falls or of snow as it melts. That portion of the precipitation which immediately sets out as run-off rapidly to leave the site of its fall may be considered as definitely lost to that particular area of soil and to the included vegetation. If more moisture is absorbed than vegetation can make use of and if

the retentive capacity of the soil is exceeded, seepage water may finally find its way into the streams back to the ocean,—its primary source. This loss of moisture is critical only in those regions where precipitation approaches the minimum needs of vegetation or other uses.

Vegetation is our most dependable ally in the control of the absorption of precipitation waters. The mantle of vegetation maintains, when unimpaired, what may be termed a geologic norm of erosion. We have no way of stopping effectively this geologic norm of erosion which, however, for well vegetated regions is not excessive. The destruction of vegetation and conditions for its renewal may bring about, in inclined and steep topography, erosion which is much in excess of the geologic norm. Only this excess erosion is within human power to control, yet it may reach stages where control is beyond practical possibilities.

The extent of water control on watersheds is measured by the possibility of controlling erosion in excess of the geologic norm of erosion. Water control here is referred to watersheds and not to the engineering works of dikes, dams and the like. In other words, we have a measure of possible water control expressed in the silt content of run-off waters. We can measure our success in water control by our success in erosion control.

SUMMARY

We have a measure of the amount of ocean derived moisture falling upon the land areas in the discharge of rivers.

We have a measure of the extent of our possible control of water on watersheds in the silt content of run-off waters in excess of that existing for geologic norms of erosion.

THE ANNUAL MEETING AS KABER AND I SAW IT

By FREDERICK S. BAKER

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Foresters who attended the Annual Meeting of the Society of American Foresters in San Francisco seemed to be either much pleased or much dissatisfied with the meeting. Two rather opposing viewpoints appear to be existing side by side in forestry—not as diametrically opposed as indicated in this following crude dialogue, but nevertheless opposed. At the convention “Kaber” did the talking and showed himself to be interested in developing local forestry and silviculture for profit, and maintaining the local forest industries—industrial forestry, in a word. All the familiar expressions of a few years ago—famine, devastation, minimum requirements, timber mining, four times as fast as it grows—were conspicuous by their absence. If these words were anything more than sounding brass, they must still have a significance, but if so, the realities behind these terms apparently had no champion at the convention. The ghost of the forestry movement of only a few years ago hung over the meeting all of the time, and thus it was that part of the foresters who attended were much pleased because the ghost did not materialize, and part were much displeased for the same reason, while the majority felt dissatisfied that the older viewpoint, and the rather localized viewpoint which was uppermost at the convention, did not both develop in such a way that the relationships between the two could be properly evaluated. That this did not happen, appealed to most foresters as a distinct loss and suggested that perhaps a hidden rift strikes across the whole foundation of forestry in the United States—a rift that can only be mended when it is brought to light.

But let Baker and Kaber have it out!

“Well, Baker, that was quite a convention you foresters had last week over in San Francisco, wasn’t it!”, exclaimed my old friend Derf Kaber as he sat himself down in his chair for an evening’s talk. Now Derf, let me warn you, likes to argue better than anything else, and he thinks that his Teutonic ancestry makes him a little bit keener and wiser than anybody else. In truth, he is more than a little con-

ceited. But I like the old duffer and so I always let him rave on and make an ass of himself because he gets such a kick out of it, and thus I took my cue and replied, "Yes, indeed, big crowd wasn't it!"

"Oh, it wasn't the crowd, Baker. Any convention can have a crowd. It was the spirit of the thing. I really wished I was a forester, instead of an outsider just dropping in to see how your profession was looking at things. No spirit of pessimism there, was there, Baker; forestry is taking hold."

"Yes," I admitted, "they certainly did show that in some regions a few more men are protecting second growth than there were several years ago; that here and there operators are thinking about sustained yield. I can't say that anybody made revelation as to what could be done to speed up the process however. Everybody pointed out how far we had gone in the face of a discouraged lumber industry and seemed to be content to plod on."

"Well, what do you want?" asked Derf, obviously somewhat surprised by my viewpoint.

"Fire. Enthusiasm. Plans to get rid of obstacles, not an acceptance of them and a contentment to plod," I replied. "We have got to have lots of forestry and quickly, here in these United States."

"Fine," murmured Kaber somewhat meditatively, "but how are you going to get it except by adding many little concrete accomplishments slowly together."

"Nobody seems to know; that I'll admit," said I, "and the real devil of it is that nobody seems to even care, any more."

"Oh I can hardly believe that," exclaimed Kaber, "the meeting in San Francisco sounded to me as if you foresters were very anxious to get on, but felt that progress depended upon a multitude of small local steps perhaps this 'dirt forestry' that I think I have seen favorably commented upon in that little green JOURNAL of yours."

"Well, doubtless that is partly right, but you must not bury your nose in the dirt. A meeting of the kind we attended is the very time to take the broad upward look and see that the national issues are not all muddled up with a multitude of local affairs."

"I'm always a little afraid of the man who talks too much about 'the broad upward look' and 'national issues,' Baker, and I must confess that your convention impressed me because there was so little of that hokum."

"Hokum nothing!" I replied with some little heat. "I—"

"All right," broke in Kaber, "come down to earth and elucidate."

"Well"—and I must confess I paused and swallowed hard a couple of times before telling my friend what the national issues were—"The situation is still as it was shown to be some eight years ago. We are cutting four times as fast as timber is growing—"

"Heavens, Baker, do I have to listen to that yet again?" broke in Kaber.

"Sure, if you can't seem to remember it. But I'll skip lightly over the coming timber shortage if you like." My friend looked relieved, and nodded, so I proceeded. "And thus we come to 1927 and are wasting virtually as much of this timber resource as ever. Our successes as foresters are pitiful in contrast with the need. But we have developed, I think, a good many converts to forestry theory, who can't put theory into practice due to the horrible condition of present overproduction and cut-throat competition in the lumber industry. As perhaps you noted, Colonel Graves mentioned during the discussion that the oil industry and bituminous coal industry were finding themselves in much the same position and that they were taking remedial steps. Just what the steps were and how they could apply to the lumber industry, I did not gather, but you know yourself that neither the coal nor the oil industry is adverse to letting the public know what a mess they are in, for if the public steps in to prevent the waste of an irreplaceable resource, the industries themselves will doubtless find themselves more stable—less hazardous and more profitable."

"And so you think that you foresters might have started the ball a rolling toward government intervention in the lumber industry to prevent waste by legislation?" queried Kaber with a sceptical gleam in his eye.

"Not necessarily that strong. In the case of competitive companies operating on irreplaceable natural resources, waste is inevitable in the race to dominate by underselling. If the operating units were very large and secure virtual monopolies, they could prevent the waste that must follow reckless price cutting competition."

"Ah, I see. You would bend the Sherman Anti-Trust Law for the benefit of dealers in irreplaceable natural resources?"

"Quite possible, Kaber. Understand, I'm just suggesting things that the convention might have discussed with the idea of helping

forestry from the top instead of spending all its time reciting how many infinitesimal foundation stones were laid. And still again, the government might pay part of the fire protection or other costs that are inseparable from good forestry in the case of operators that meet certain minimum standards."

"Subsidy!" growled Kaber, "I, like most good Americans, sort of shy away from that kind of thing. But, Baker, whatever you do—subsidize, force, or allow benevolent monopoly—it's going to make lumber cost more, isn't it?"

"I suppose it is, right now," I replied, "but thirty years hence it will be a different story. Conservation now means plenty later."

"Yes, I suppose you are right, in theory at least. I was just thinking what a job you were suggesting for you foresters, however. You suggest that to prevent waste—"

"Understand," I broke in, "I'm not so much concerned with waste of *wood* as waste of land—the productive capacity of land, for it sometimes happens that waste wood can be utilized at an immediate profit, while waste land is usually kept productive only at some expense, and—"

"Yes, yes, I get you exactly," went on Kaber, "you make the task even greater. You propose to say 'My dear public, much cut over forest land is going to waste, because lumber companies can't afford to continue to hold it for timber production purposes. Now you can see that it ought to grow timber because it already has been doing it and if it stops now it's a waste, and besides some years hence you'll be wanting that timber, so come now, dear public, dig down in your jeans and pay the nice lumberman to keep the hills green for you!' That's your proposition in one form or another, I take it. The half that says that timberland ought to be kept productive has been pretty well put across in a rather sweet sort of way like the idea of the meek inheriting the earth, but when it comes to convincing the public that it costs money, and that the lumberman needs aid from the public purse, you are tackling something yet again."

"True enough," I replied, "though you don't have to express it in quite such offensive terms. How the timber operator will maintain his lands in productivity unless he is forced or paid to do so is a mystery to me. And there lies the great national mission of foresters, to make the public see that particular point and to act. Several lines of action are open—but the main thing is to act. Do it now, hard!"

"They didn't say much about it at San Francisco," broke in Kaber.

"No, that's what I'm telling you. They failed to take any broad action on national issues. Haven't I made myself plain?" I continued.

"And yet forestry is spreading, little by little. They all said it."

"Yes," I agreed, "it is. The value of second growth is becoming apparent here and there. The advantages of continuous yield over 'timber mining' have turned out to have a real meaning in dollars and cents in some places, and the real loss in logging small trees has been definitely shown in many regions. In other places, tax reforms have helped the game."

"In other words, forestry has paid—right now," said Kaber. I agreed and he continued, "Well, is this progress at an end? Are all taxes just; have all the advantages of continuous production been exploited? Does every operator know whether he is spending good money on poor small logs?"

"No, of course not. Much progress is being made and—"

"I should say there is, if that meeting was any sign. And I liked that meeting—I really did. The men on the ground are building a real foundation of forestry because it's natural, and I'd rather trust that kind of stuff than working for some grand affair that through some legislative hocus-pocus, promises to usher in a golden age of forestry. I don't think you fellows would look very pretty sitting on the throne with Old Man Subsidy ready to stab you in the back any minute, or Old Government Controlled Monopoly fiddling with a bomb. They are dangerous friends, and so are all their kith, kin, heirs and assigns. Dig in your own foundations and be satisfied."

"I believe many of the men at that convention would rather agree with you in principle if not detail, old man, but you deliberately overlook the urgency and seriousness of the situation," I objected. "We have got to have big changes coming quickly if the forests of America are to be maintained."

"Well—why maintain them?"

"I thought you just now objected to me re-telling you all about the coming timber famine and the—"

"I still do."

"Well, that's why and it's a perfectly good reason for hurrying up forestry. In thirty years—"

"There you go; the mystic thirty years. I wonder how foresters are put together. The shortage is never to come 25 or 35 years

hence—always 30! But that's beside the point. I am not convinced your timber famine is coming, or if it comes, that it will be a very terrible thing anyway."

"Well," I countered, "I can't argue with you on that basis. No real forester takes that viewpoint."

"Then I'll bet you have a bunch of fake foresters in your organization. I don't believe the famine bogey scared many people over there at your convention; I hardly heard it mentioned. I did hear trade extension, more markets and so on. And right here, I once read something on your table, where at a meeting of foresters one said: 'The man who can't see timber famine needs a diagram, raised letters and a club,' and afterwards, that same body of professional foresters couldn't agree at all; and one even said he thought we were at the peak of the shortage right now. That's how you experts believe in the famine!"

"I must say, that I think you are a million miles off on that proposition, Derf. But granting it, there still lies the economic waste of turning productive forest into unproductive waste land."

"Yes, and they might grow cauliflowers on the roofs of New York skyscrapers too—there is a lot of waste space there. Of course it wouldn't pay, but how do you know keeping the timber land productive would pay either?"

"It doubtless would pay in the long run," I objected, "because our timber supplies are diminishing and we must grow our own stuff now, for that time in the future."

"Hold on there, friend, you are going in a circle. You must grow timber for the famine years, but, even granting there is to be no famine you must grow it to keep the land productive because you will need it anyhow when the famine comes, even if it doesn't come. That's what you are saying, Baker, and it's tommyrot."

"Well, you are not talking such remarkable sense yourself. I could argue this out with you all night but I see you are so full of somebody's propaganda about there being wood enough for us all that you won't see the light if I show it to you. So I merely ask you what about public values involved. The land should be kept growing forest for the welfare of the local industries and the public, the prevention of erosion, the maintenance of adequate recreational facilities even if you won't allow that it should be so kept to produce a plentiful supply of cheap wood for America forever."

"I could pick you up on that word 'cheap' and give you a run for your money, Baker," said Kaber, "but we will let that go. You propose extending aid on some national scale to the forest operator so he can afford to keep the forest green for protection, recreation, and the continuance of local prosperity, hey?"

"Yes, and please remember, that I myself still propose to produce wood for the period of shortage."

"Yes, I'll bear that in mind. Well, let's take erosion; it is worst where the forest is poorest; it is controllable by brush cover; it is very, very, important. Right off-hand, I'd say put the areas requiring special management into National Forests and if the rest wants to grow up to brush—let it. And personally, I'd rather be taxed for parks than for some halfway recreational benefits such as you are talking about. But that other point—" he mused a few moments—"there you have said something. The permanence of the industry does mean a lot. Personally I don't care a whoop whether the man in Pennsylvania who wants to build a chicken house pays out his money for artificially grown Pennsylvania pine, old growth fir from Washington, or Philippine mahogany, nor am I very greatly concerned about what price he has to pay. But, man! I hate to see these prosperous little milling towns—and some are not so little—go to the devil after a mere 40 years existence or so."

"You want to see sustained yield come in?"

"I sure do," exclaimed Kaber warmly.

"Well—that means keeping the land productive or else you will never get a second cut. It means large operating units cutting in large amounts year after year. It means that things must be fixed so a mill is not forced by economic conditions to throw all its timber onto the market at breakneck pace when it would prefer to go onto a sustained yield basis. And all this—as I've been trying to say the whole evening, calls for a national policy—something big and wise."

"You jump at conclusions too fast, Baker," remonstrated my difficult friend, "It needs profit in sustained yield—more profit than in destruction. You want to legislate that profit all at once—a most dangerous proceeding, my boy, while I think that it ought to be naturally developed on the ground, just as the speakers at your convention showed it was coming."

"Too slow and piecemeal," I objected. "You don't like to have me say that we must hurry because of the impending shortage, so

I'll say, hurry to save scores of little towns such as you have pictured."

"Farm relief would save a lot of farmers—a lot of bum farmers, too, let us add. I am not for farm relief—I don't know about you?"

"Oh, but Derf," I remonstrated, "you are too silly in your fears about government subsidy. The Tariff is doing it for a thousand industries every day. It can't do it for the lumber industry by tariff. The form will have to be changed, but the intent is the same. What's wrong there?"

"Politics plus economics make dynamite," was all Kaber deigned to reply.

"So you prefer to go slow and naturally, studying to make profit under present handicaps and getting a little half-baked forestry added annually to our slender quota of accomplishments, rather than boldly taking the political bull by the horns and throwing him? And meanwhile mill towns are being abandoned, mountain slopes are growing up to brush and—though you doubt it—America is sailing into a timber famine. And yet you won't seek a national remedy!"

"Oh, why be so pessimistic. You foresters haven't exhausted all the possibilities of showing profit in forestry, indeed you have only scratched the surface. Forestry is working. You seem to overlook that, working under present conditions in several regions. A profit is being shown. And if you want to come down to general moral issues and talk 'duty,' as you foresters always do, I'll tell you that I think sooner or later the average operator will consider it much more his duty to keep his forest going to maintain his mill and the town dependent upon him—the very civilization of that little chunk of the United States—than to produce properly cheap American lumber for a dog house in Council Bluffs, Iowa. There's where your strength lies, and I think the dirt foresters at your conference showed it. Forestry is a business, not a Crusade."

"Well, Derf, I'm afraid you are an unregenerate heathen. You are all right as far as you go, but I'm sorry you can't see things more broadly. You wait. My ghost will yet tell yours 'I told you so' unless foresters wake up and show themselves competent to work out a plan of salvation on a national scale."

"That may be. But I got my ideas from your forestry convention, plus perhaps a modicum of background that goes back to school days. Did I misinterpret what I heard?"

"No," I admitted, "at least probably not seriously, if you pick on extreme views. But there are a million things every forester knows. They were there though unexpressed—lying in the background of everybody's mind."

"And to quite an extent antagonistic to what was being said, I should add," retorted Kaber—, "that is, if our little argument here to-night was in any way representative of the two viewpoints."

"Perhaps—," I admitted with some doubt.

"Anyway," exclaimed my friend, "I think you would agree that if there are two ways of viewing this problem, more progress would have been made if both sides had come out and found out how they were related—whether they really are antagonistic or complementary—and thus cleared the decks for action!"

"Yes," I exclaimed, I think we can at least agree there.

And when Derf Kaber and I agree anywhere, we stop, or else we should quibble all night long.

REVIEWS

Mitteilungen der Schweizerischen Centralanstalt für das forstliche Versuchswesen.* [Communications of the Swiss Forest Experiment Station.] Vol. 14, No. 2, 163-292. 1927.

This second number of the 1927 volume contains 4 articles in German of which the first, third and fourth have summaries in French. The articles are scholarly presentations of the results of investigations and include discussions of the literature, basic data, relationships and conclusions, and bibliographical references.

(1) Die Berasung von Schutthalden im Tiefland und Hochgebirge. [The establishment of vegetative cover on land-slips in lowland and mountain.] By A. Volkart. Pg. 163-194. The chief difficulties are lack of soil moisture, insufficient aeration of the soil, low biological activity and scarcity of nutrients. Sowing of suitable species of legumes and grasses has given promising results. The development, longevity, and cost of different species and mixtures, desirable densities, soil cultivation, fertilizers, purchase of seed and time of sowing are discussed. The article might be suggestive to foresters concerned with the rehabilitation of over-grazed range.

(2) Über eine Pestalozzia-Krankheit der Nussbäume. By Dr. E. Gäumann. [A Pestalozzia disease of walnut.] Pg. 195-200. Serious losses of seedling walnuts in the nursery were found to be due to a damping-off fungus, *Pestalozzia funerea* Desm. The suggested remedy is to improve the physical conditions of the soil or select a nursery site favorable for walnut.

(3) Physikalische Eigenschaften von Wald- und Freilandböden. II, Einfluss der Durchforstungsart auf die physikalischen Eigenschaften der Waldböden. [Physical properties of forest and open soils. II, Effect of thinning upon the physical properties of forest soils.] By Hans Burger. Pg. 201-250. Determinations of moisture content, volume weight, pore space, moisture capacity, air capacity, specific gravity, rate of downward movement of water, and acidity

*The splendid publications of the Swiss Forest Experiment Station unfortunately have not lately been reviewed in this JOURNAL. It is hoped that from now on they may be regularly and carefully reviewed for the benefit of American foresters.

are presented in detail for the soils of 3 stands, each of which contained 3 types of thinning. The first was natural beech forest, one plot thinned lightly from below (B thinning—the German designation of degree of thinning), the second, heavily (D) from below and the third from above. The second was a planted forest of pure spruce thinned as the first. The third area was mixed hardwood and conifers, one plot unthinned, the second thinned moderately (C) from below and the third thinned from above. The beech and spruce plots were thinned 25 to 35 years and the mixed plots 13 years before the soil samples were collected, when the stands were 20 to 25 years old. The differences in the soil properties are attributed to the effects of the different degrees of thinning. Questions might be raised whether the changes in the soils would take place in the comparatively short periods of time and whether the soils were uniform at the time of thinning. Presumably data were not available to answer these questions.

In the beech plots, the heavy thinning from below had a bad effect on the soil properties. The volume weight was increased, the pore volume decreased and the air capacity reduced to 12 per cent as compared with 14 per cent in the lightly thinned plot and 17 per cent in the plot thinned from above. The downward movement of water through a thickness of 10 cm. required respectively, 6, 3, and $2\frac{1}{2}$ minutes.

The spruce plots which had been cultivated for farming before they were afforested, had much less capacity for air than the beech plots, and were much less permeable. The air capacity of the lightly thinned spruce soils was 10 per cent and of the heavily thinned, only $5\frac{1}{2}$ per cent. The downward movement of a 10 cm. layer of water required on the average 14 minutes for the plot lightly thinned and that thinned from above and 36 minutes for the heavily thinned plot.

In the mixed forest plots, the moderate (C) thinning resulted in higher volume weight, and lower pore space than in the others. The air capacity of the soil was $15\frac{1}{2}$ per cent in the unthinned, 13 per cent in the plot thinned from above, and only 7 per cent in the moderate thinning from below. The corresponding numbers of minutes for downward movement of water were 4, 9, and 23.

In general, the experiments show the bad effects of cultivation and planting of pure spruce. They prove that the maintenance of the physical condition of forest soil demands permanent forest cover.

Too heavy thinning, depriving the soil of shelter, leads to diminished fertility. Too dense cover on the other hand, may be unfavorable if the soil does not receive sufficient light and heat. In marking in selection or high forest stands, consideration should be given not only to the condition of the cover but also to the maintenance of favorable conditions of the soil.

(4) Über den Einfluss von Trockenperioden auf das Bestandeswachstum. [Influence of dry periods upon forest growth.] By Dr. Philipp Flury. Pg. 251-292. Detailed data of monthly, seasonal, and annual precipitation and of seasonal air temperature and air humidity are given for dry and wet years from 1906 to 1924. The periods selected for study of the relation to forest growth are, 1911-1916, wet; 1916-1921, dry; and 1921-1926, wet. For these periods, sample plot data were selected to represent pure stands of different species, mixed stands, mountain and lowland sites, different exposures, densities, and different kinds of silvicultural management. For each plot, are given the elevation, exposure, topography, soil, origin, site quality, silvicultural treatment, species composition, age, and for each period, the number of trees per hectare, average diameter, average height, total volume, current growth in basal area, diameter and volume, and average and maximum width of rings. These data for fourteen plots or sets of plots provide in themselves extremely interesting material for study and comparison in addition to the correlation with the climatic records which is the object of the article.

The author's conclusions are as follows:

1. In the foothills and mountains of Switzerland up to 1,400 meters, spruce in pure stands suffers most from the long dry periods. The variation between dry and wet periods in basal area and volume may amount to as much as 40 per cent.

2. Beech adapts itself better to extremes of moisture supply, suffers less from drought, and varies less in increment. Oak, pine and larch behave like the beech in these respects.

3. No appreciable difference was found between heavily and lightly thinned stands.

4. The most effective means of avoiding damage from dry periods is to establish mixed stands, particularly by introducing hardwoods among the conifers.

5. Another means is to aim toward a mixture of age classes, as by natural regeneration in groups.

6. For permanent protection against drought, avoid exposing the soil by clear cutting.

7. In the high mountains, where heat is the important element for forest growth, dry periods may cause better growth than wet and cold periods.

8. A single dry year may effect adversely young plantations and their height growth but in older stands, the effect only appears after several successive dry years.

J. KITTREDGE, JR.

Armillaria mellea (Vahl) Quel., Cause du dessecchement des forêts de Chêne en Yougoslavie. [*Armillaria mellea* (Vahl) Quel., as the Cause of the Drying-up of the Oak Forests in Jugo-Slavia.] By Pierre Georgévitch. Comptes Rendus des Seances De L'Academie des Sciences. Tome 182, No. 7, 1926.

The oak forests located largely in Slavonia are undergoing at the present time a very grave crisis which threatens their destruction. An effect, the drying up of the trunks of the oaks, which was observed sporadically as early as 1902, reached such large proportions in 1912 that it almost became a disaster. This malady attacked the oaks of all ages, from very young trees to those over 200 years old. The number of trunks attacked by this drying up is enormous—in the forests situated on the borders of the Sava River, the amount is over 500,000 cubic meters. This enormous waste of material merits attention and has now attracted the interest of investigators who incited an investigation of the malady to determine its cause.

The data resulting from these investigations have differed; some of them being even contradictory. However, the primary causes given as to why the oak forests are drying up are: certain worms (*Liparis dispar*, *Liparis chrysorrhæa* and *Bombyx neustria*); the *Microsphæra Alni*, var. *Quercina* Neg.; the limonite, and the rainfall.

However, since the oaks show relatively large resistance, it is likely that they will reproduce. It is difficult to determine whether it is a single one of the agents cited above which is killing the oaks, or several acting simultaneously or one after the other. The drying out usually takes place rapidly and its appearance is hasty which makes difficult the correlation of the actions of the various agents.

The attention is called particularly to the anatomical and physiological changes in the roots and stems of the oaks, as they are the

primary indication of the illness. A study of the roots of the attacked trees show the presence of rhizomorphs, variety *terranea* d'*Armillaria mellea*, on the bark of the roots. The rhizomorphs, thanks to the very thin, colorless hyphæ and their ramification over the surface, probably penetrate whatever injury they find in the bark and the xylem of the root, thus disorganizing the cortical tissues and the cambium. The flattened rhizomorphs send into the cells of the xylem colorless hyphæ, which, from the middle of the rhizomorph are in a vertical direction and from the extremities in a lateral direction. These hyphæ, colorless at the beginning, turn shortly to a brown color, lending in this way their color to the host-cell. At the same time, their form in the region of the middle of the rhizomorph is sort of nail-like and at its extremities the black lines have the form of a circle which frequently makes a closed ring under the surface of the xylem.

The mycelium extends along the root from one vessel to another and thus enters the bark and xylem of the trunk. At this stage the mycelium acquires a property very favorable to its development. As a primitive filament and very ramified, the mycelium produces a swelling at its extremity and forms an actual globule. The process is repeated by the entire hyphæ which transforms at last to a certain number of small globules, colorless at the beginning but changing later to a brown color. The globules completely obstruct the lumina of the vessels in the roots and similarly of those in the trunk and cause a stoppage in the circulation of the sap in the tracheids and trouble in the transpiration and nutrition.

It is after this that the leaves wither on the branches in which the vessels are obstructed by the gobules formed on the hyphæ, and even the branches themselves dry up.

The mycelium of *Armillaria* penetrates across the structures of the roots into the stump of the oaks and going up into the trunk, or equally as well, descending down and spreading its ramifications into the uninjured roots, by which it obstructs the vessels in the same fashion as the globules of the hyphæ.

Since it is the process of the contamination of the roots by the ramifications that determine the degree of withering of the trees, this in reality is the result from top to bottom. In addition, the mycelium which extends through the bark and xylem into the trunk, grows thick rapidly and forms a layer of 170-190 μ thick. It is in this layer,

formed by the gathering together of the hyphæ in a cluster, that the rhizomorphs dry up the corticle without ever reaching the crown above, already dried from the trunk, because the rhizomorphs can only extend themselves under living or at least still succulent bark.

The result of all the preceding regarding the drying of the trunks of the oaks and therefore of the forests as a whole, is that it is the result of the mycelium of *Armillaria mellea*, which ruins the bark and the cambium of the roots and the trunk and then obstructs the lumina of the vessels of these same parts of the tree. The diminution in the absorbtive power of the roots is the result and trouble with the transpiration due to the obstruction of the vessels are all due to the action of the mycelium of *Armillaria mellea*.

The case described is a good example of a saprophyte becoming a parasite—a parasite of wounds.

JAMES L. AVERELL

Forestry in Sweden. Department of Commerce Trade Promotion Series No. 56, 1927. By Emil Kekich.

This report, in the form of a twenty-seven-page pamphlet, serves to supplement Axel Oxholm's more technical and thorough bulletin, "Swedish Forests, Lumber Industry and Lumber Export Trade," published in 1921 as Special Agents Series No. 195, Bureau of Foreign and Domestic Commerce. Mr. Kekich, American Trade Commissioner in Stockholm, has covered the elapsed period since its publication and offers new figures for Sweden's forested area, annual increment and value of products produced. Since Oxholm's bulletin was written, Sweden has completed the major portion of her nation-wide cruise of forest land, has recovered from war-time understocking, passed certain new forest laws and widened her foreign market for her forest products.

A brief summary is given of the Swedish Conservation Board and its part in national regulation of the cut. Also is included an example of industrial forestry as practiced by two of Sweden's largest companies. The paragraphs on forest taxation show that America is not alone in the struggle to solve this problem.

While this pamphlet in no way takes the place of Oxholm's treatise, it affords an interesting complement with its present day figures.

JAMES L. AVERELL

Om Sommarvarmens Innflydelse På Årringbredden (The Influence of Summer-temperature on the Width of the Annual Ring.) By Erling Eide. Medd. fra Det Norske Skogsforsksvesen, H. 7, 1926.

While making a cruise in the fall of 1922 in Hedmark County, Norway, a number of sample trees were bored to investigate the variations in the annual ring growth. These were later worked up to show the effect of a single year's climate on the thickness of the increment. Using 1243 cores of virgin spruce, the width of the last twenty rings were recorded for each in tenths of millimeters. They were kept in groups, however, depending on their recorded site, age class, density, stand form and soil moisture. In each group the average annual ring width was obtained for the period 1903-22 and an attempt made to correlate them with the temperatures for the past twenty years.

Eide points out that in the last fifty years, few investigations along this line have been made. Hesselman in 1904 worked out a scheme for the influence of temperature—that the preceding year's climate determines the height growth of pine while the diameter increment depends on the present year's temperature. Eide thinks Hesselman's conclusions are based on too scanty field data. Wallén in 1917, with even a less number of stem analyses, supported Hesselman's conclusions and sought to mathematically show the relation between increment and the temperature for the year as well as for individual months and the precipitation, but his data were so limited that the conclusions seem unreliable.

In 1920, the Finnish investigator, Lakari, published his results of investigating the ring widths of 300 pines in the 100 year age-class. Lakari found the spring months, especially April, of the greatest importance—that is, a warm spring brought an earlier and therefore longer growth period. Furthermore, he pointed out a periodicity in their width which appears to be dependent on the eleven year sun spot periods.

Kolmodin, in 1923, contributed some conclusions based on a large amount of data taken from pine sample trees located in northern Dalarna, Sweden.

1. In stands where no thinning has been allowed to disturb the forest conditions, he found that the increment varied to a high degree for individual years as well as over periods of years.

2. To fairly judge the results of a thinning in a stand, one must

take into consideration the climate's influence upon the increment.

Kolmodin carried out a long correlation calculation in which the temperature between June 10 and July 25 seemed to be of most importance for annual diameter increment in northern Dalarna. When the temperature of this period became greater than 13.7° C, the increment would show an increase; when less, the increment decreased. Yet he emphasized that in tracts other than north Dalarna, different temperature relations might hold true.

In spite of the fact that in Germany, investigators have been able to show a strong relation existing between precipitation and increment, none of the Nordics have been able to establish this. It may be due to the heavier precipitation in the North Baltic countries where the limiting-factor becomes more often temperature rather than precipitation.

Eide's data show that in Hedmark County there is an important variation in the annual ring width of spruce. This variation is strikingly the same for all the groups into which the 1243 sample cores were divided. There was no special difference found between the trend of growth in even aged and in selectively cut stands, nor in the different site classes. So all these groups were collected together under four degrees of density and four degrees of soil moisture.

His conclusions follow:

1. It can safely be said that a wide variation in the width of the annual rings is possible from year to year, and this variation follows the same trend in both dense and open forest stands, and on dry or moist soils.

2. Each year's summer-temperature (June and July) appears to have a direct influence on the width of the current annual ring, without regard to the preceding year's temperature.

JAMES L. AVERELL

Vaxttidsundersökningar Å Tall Och Gran. (Investigation of the Growth Period of Pine and Spruce.) By Lars Gunnar Romell. Medd. från Statens Skogsförsöksanstalt. H. 22, 1925.

It is a little surprising that Eide, in his "Influence of Summer-temperature on the Width of the Annual Ring," does not mention this contribution published the year before, in Sweden. However, it is possible that they both may have gone to the printer's at about the same time, making reference impossible.

Romell has carried out an investigation on the methods most suitable for taking phenological data, looking forward to the time when an extensive study can be made embracing all of Scandinavia. He supervised the taking of measurements for three years on annual height growth and diameter increment in various parts of Sweden.

To study height growth, ten stations scattered over almost eleven degrees of latitude from north to south Sweden were chosen and every week during the vegetative period, the top increment on certain trees was measured in mm. To make certain that the ten observers would take comparable measurements, diagrams of top growth in pine and spruce were given to each, showing the exact points from which measurements were to be made. At first, the collection and preserving of the top growth itself from several trees each week was tried, but proved unsatisfactory.

Time for the beginning of tip elongation showed a general trend from south to north only in the case of pine. With spruce, the strong variation from place to place, due to local conditions, hid the general trend one would expect to find.

The length of time that the top growth continued, varied quite a little both for pine and spruce; likewise from station to station and year to year.

The weekly top increment showed a close relation with the temperature of the same period. This apparently contradicts the earlier investigations of Hesselman (1904), Holmboe (1906), Wallén (1917) and Laitakari (1920), which showed that absolute height growth is related to the temperature and length of the previous summer, but Romell points out that this is not contradictory in that a higher current temperature during the height growth brought about a shortening of the period for increment and did not influence the total accretion for the year.

The study of diameter increment was concentrated at Hoting in north central Sweden, on four areas of different degrees of thinning. Short cores were taken with an increment borer each week during the vegetative period from five chosen trees on each area. Also changes in length of circumference were recorded as occurring on certain of these trees. This latter method by means of an inexpensive contrivance, was fully satisfactory from a purely technical point of view, and much superior to the core taking method in giving even average curves for the different groups, because the necessity of taking the

weekly borings at different places over the stem as the season advanced, caused a variation in the data. Yet the core data had to be used as the final word, even if a systematic difference showed itself between them and the circumferential growth curves, for they represent, even though imperfectly, the actual, constant increment. Earlier investigations have shown that circumferential growth measurements are subject to variations due to water content of the bark and cambium, even showing a daily variation. So one is in a dilemma as to which method is the least undesirable; the one method is bothersome and not very accurate but gives an expression of actual increment, the other is much easier and obviously technically better, but it is difficult to say just what it is that one is measuring, i.e., whether momentary increased water content of the bark or actual diameter accretion.

Diameter growth during two of the years the investigations were conducted, began only a few days later than the top increment did, but during 1923, a couple of weeks later. The period for diameter growth varies for different years very much more than the time for height increment.

The very practical contrivance rigged up for the measuring of the circumferential growth is of interest in that it is inexpensive, easily moved from place to place, accurate enough to show the trend of seasonal changes in rate of increment and even winter shrinkage of the tree stem due to cold, yet not so accurate as MacDougal's registering dendrograph which introduces variations due to time of day.

By shaving the loose bark off in a band around the tree stem, small brass blocks of a specially illustrated design are placed along it and fastened to the bark with short screws. To make sure that the screws do not fasten into the wood itself, and thus prevent the blocks from responding to growth changes, an awl is used to determine how thick the bark is. Some of the younger trees had to be abandoned as having too thin bark. The end of a thin steel tape is fastened to one block designed for a measuring block (illustrated in article) and resting on the evenly spaced based blocks, comes around to the measuring block again and off at a tangent, being held in place by a small weight attached to the loose end of the tape and acting over a pulley.

JAMES L. AVERELL

The Growth of Hemlock before and after Release from Suppression, by Robert Marshall. Harvard Forest Bulletin No. 11. pp. 43. Illustrations 10, tables 8. Harvard University Press, 1927.

Increasing the growth of hemlock by early suppression may be rather a startling idea to foresters who have not studied the peculiar habits of this formerly despised species. The author of this latest contribution from the Harvard Forest found in his analyses of 784 hemlock trees that those which start life under suppression, after release generally overtake and surpass their open grown neighbors. The unsuppressed trees show a rapid decrease in diameter increment after about sixty years while the released trees are still making satisfactory growth. The reasons suggested for this phenomenon were competition of other species, the preference of hemlock for cool, moist sites, and the maturing influence of greater light.

Among the other interesting conclusions given in the summary and supported by the statistics presented are the following:

"Suppressed hemlocks show a remarkable increase in growth when released. An examination of 326 trees showed that the ratio of diameter increment for forty years before and forty years after release was as 1 is to $5\frac{1}{2}$.

"There is little relation between the diameter and age of hemlocks which have been suppressed. Hence it would be impossible to even approximate the age of a given tree knowing only its diameter.

"The response of hemlock stands to release is influenced by their density, the well stocked stands showing greater acceleration in growth than poorly stocked stands.

"For a given diameter it was found that, within limits, the older the tree when released, the greater its response to freedom.

"Hemlocks growing on relatively dry sites showed a close correlation between decadal increment and decadal precipitation. On the other hand, those found on moist sites showed no relation whatever between growth and precipitation."

Under Silvicultural Conclusions, the author discusses the value of advance growth reproduction, the necessity for a short rotation for unsuppressed hemlock, and the beneficial effects of suppression, and outlines the advantages of the group selection method in pure hemlock.

The nature and history of an unusual stand of white pine and hemlock in northern Massachusetts are described. A search for the reasons for the development of this stand of pure softwoods, in contrast to the usual mixed inferior growth following cuttings, led to the general investigation of growth and release of hemlock. The study was confined largely to hemlock and white pine mixtures in northern Worcester County, Massachusetts. It deals chiefly with breast-height diameter growth rather than the more significant volume growth, because of insufficient height and form measurements. Even though of limited scope, the study is of considerable value in pointing out facts which, if found by further investigation to be applicable to hemlock throughout its range, may greatly modify silvicultural practice in dealing with stands containing that species. The clear, simple, and attractive form in which the material is presented deserve commendation.

E. L. MOWAT

Parks. A Manual of Municipal and County Parks. L. H. Weir, Editor.
(A. S. Barnes & Co., N.Y.)

This forthcoming compilation is announced by the publishers as being the result of a nation-wide survey of municipal and county parks, which was conducted by the Playground and Recreation Association of America in co-operation with the American Institute of Park Executives, at the request of the National Conference on Outdoor Recreation.

The twenty-one chapters discuss the following subjects: Old Parks and New, The Why of Parks, General Planning of a Park System, General Municipal and County Park Planning, Notes on Elements in the Design of Park and Recreation Areas, Construction Notes, General Administrative Control of Parks, Park Financing, The General Executive Organization of a Park Department, Office Organization and Management, Park Engineering Division, Maintenance, Horticultural Division, The Recreation Service Division, Park Policing, Park Lighting, Park Sanitation, Zoological Parks and Aquariums, Botanical Gardens, Educational Publicity, The Training of Park Executives, and General References to Literature on Parks.

To judge by the foregoing list, the scope of the book should be wide enough to interest the superintendent, the engineer, the recreation executive, and the scientist.

NOTES

DISCUSSIONS AT THE ANNUAL MEETING*

Excerpts from the discussion following papers by Mr. Compton (see Feb. JOURNAL OF FORESTRY) and Mr. Granger (Feb. JOURNAL OF FORESTRY.)

Graves: "Every time we consider any move in forestry we come face to face with the problem of over-production of lumber, the excess development of manufacturing plants, the inability of the industry to curb the cutting of lumber in quantities beyond the needs of the consuming public. The great cloud of over-production of lumber with its long trail of consequences injurious to industry and to the public, overshadow all efforts toward forest perpetuation.

We have had during the past year the picture of several great industries coming before the public and stating that they are unable to meet the problems of an orderly and economic exploitation and development of the basic natural resources. One of these is the bituminous coal industry. Excessive mine development, over-production, unstable markets, waste in exploitation, irregular operation, are all familiar expressions in the coal industry. And there is an appeal to the public looking to aid in stabilizing the industry for the benefits of every interest concerned from the miners to the owners and the public itself.

Now comes the oil industry and presents its case to the public. Too many wells are in operation, more oil is produced than is necessary, uneconomical and wasteful methods are used, a great resource is being dissipated rapidly, and the industry is helpless to check the waste. Here again is over-production and no way to put on the brakes. To the appeal of the coal and oil industries there has been a sympathetic response. A few years ago this would have been impossible.

A similar situation exists in the lumber industry. Our great remaining reserve of timber is being exploited in an uneconomical and wasteful manner. There are too many mills, too much lumber is produced, there is now no effective means to correlate production with the needs of the consumer. This fact we cannot escape; it must also be faced by the public with the knowledge that the greatest loss is to the people of the country.

When I hear a paper like that of Mr. Granger, constructive and thoughtful as it is, the question comes to me whether the sort of program he proposes is really going to meet the situation; whether it is not going to be necessary to go much deeper to the roots of the trouble and find a way actually to curb the amount of lumber manufactured and to bring it into proper relationship to the needs of consumers. If this is so, why should not the matter be brought before the public, just as other industries are doing, and the sympathetic help of the country be obtained in a problem that affects in the long run the interests of all citizens?

* These papers came too late for inclusion in the February issue of the JOURNAL. With their printing in this number, the proceedings of the annual meeting have been more fully covered than those of any other annual meeting of the Society.

The present situation in lumber and also with coal and oil results from a short sighted, badly handled, public land policy. We adopted the very wise principle of disposing of the public lands to settlers for the building up of agricultural homes. We were to be a nation of small land proprietors. This was a splendid objective, and the laws, in spite of many abuses, accomplished their main purpose where lands of agricultural character were concerned. The laws worked badly where the lands were not agricultural but were valuable for timber. Even the Timber and Stone Act was unsuited to any purpose beyond providing a way to acquire legally small tracts for the needs of small communities. The law had to be broken to build up an economic unit for timber development on a large scale.

In any event, the nation distributed its timber lands to an enormous number of people. Then as rapidly as possible these people undertook to realize on the property. The final result is the multiplication of competing plants and over-production with all its consequences. No more effective plan could have been devised for the destruction of the forest resources of the country.

In my opinion we have here a problem of national concern and national scope. The present situation is the direct result of a blundering policy of the nation in handling its public lands. If the non-agricultural lands had been retained in public ownership and the timber sold as needed, as may now be done in the National Forests, there would today be the basis for an economic development of this great resource. The federal laws prevent the association of owners together for the curtailment of production by agreement. So the country stands helpless and sees its timber being dissipated with shocking wastage. Personally I do not believe that the problem of over-production can be solved by the various proposals made from time to time. Better organization of the industry, better financing, better merchandising, intelligent study of conditions by operators, expansion of export trade and all the rest may help, but these features are not adequate to prevent too much lumber being manufactured and the forests cut off prematurely. And as long as this condition persists, forest perpetuation is almost blocked.

I think that the nation should assist in the problem, if necessary by legislation or otherwise, to make possible a curbing of over-production and at the same time to protect the public interest in forest perpetuation.

My home is in the East, in one of the most conservative sections of the country. At present there is something of a states' rights movement directed against too much governmental participation in industrial and other matters. This states' rights movement has actually touched forestry, as many of you know. Thus Maryland, under the inspiration of its Governor, Mr. Ritchie, has not long since withdrawn its invitation to the Government to acquire forest lands within its borders under the Weeks Law. But in spite of this attitude in the East, I am confident that there would be widespread sympathy to any broad national plan for checking the premature and wasteful exploitation of the western forests, provided that such a plan would result in a more economical development of the timber, in the stabilization of industrial conditions, and in perpetuating the forests after cutting the timber.

Personally I am not reconciled to seeing the great reserves of timber melt

away with little advantage to anyone and proper forestry practice checked, without some effort to correct the causes of the trouble, namely, over-production. It is my belief that we have not been thinking in large enough terms.

I believe that the private owners will find it impossible to meet the situation without public co-operation. If a large and far-reaching plan of national co-operation in securing a stabilization of the present unstable conditions of production were proposed, with the benefits to the public in forest perpetuation and other matters in mind, I believe that national support would follow."

Zon: "I believe the West Coast forest problem is a national problem. Take our export trade! Do you realize that you are shipping the lower grades to the Lake States, while higher grades are going to Japan? As a matter of fact, if any market can be developed in the Orient, it will be for lower grades. They require there cheap lumber. They cannot use high grade material. I was told that after the Japanese earthquake, Japanese dealers stocked enormous quantities of American lumber and when the field for shortage of lumber was gone, the Japanese could not sell American lumber because their consumers would not pay the high prices. Russia is making inroads into China and competes with American timber. They supply cheap lumber. China cannot buy our high grades. Australia and New Zealand can use some of our American lumber. Instead of dumping your lower grades on the Lake States, develop a market for your lower grades in the Oriental countries because those are the kind of grades that have the best chance to succeed."

Mason: "There is one particular feature that I would like to speak of since Mr. Granger mentions some things that were stated in a paper that I had in the JOURNAL recently, and that is this: Mr. Granger's understanding of my paper was that the United States forest regions would not eventually be able to supply the softwood requirements of the United States if the forests were put on a sustained yield basis. I am in agreement with Mr. Granger in that particular thing. I am sure, as far as anybody can be, that the forests of the United States can provide all the softwood that we are using now, but I tried to say, in my paper, that if we put our softwood forests, as they exist today, on a sustained yield basis that they will in due time, be able to provide an annual cut up to the present cut. They can eventually, without question, but I am convinced that they cannot do it today. My data is based on the Forest Service published data. Of course, the Forest Service more than any one else recognizes that that data is open to question in various directions. To my mind, over-production is enormously important for the reasons that others have given earlier. Forestry is not getting ahead. It is being set back because we are over-producing here in the West. Over-production here is having a world wide effect. Of course, it is important here. It is at the bottom of our forestry difficulties and at the bottom of our industrial difficulties. It is true, we need this campaign to fight substitutes, so to speak, but that campaign will be of little avail if we continue to flood the market with lumber. We cannot get new orders for lumber as fast as the manufacturer can make it, and this will remain as long as the manufacturers continue on an unregulated basis. And they will not change from this practice unless they are prevented."

Lowdermilk: "I have been somewhat out of touch for the past five years

with the details of the forestry situation in America, but if I may, I should like to present some ideas that I have accumulated through wide wanderings, on foot most of the time, through China, where a civilization has adapted itself to the earth for over four thousand years. I want to offer an observation on the possibility of China as a future timber market of the United States. I certainly appreciated President Wilbur's grasp of the situation confronting the Pacific countries. One point with regard to the possible purchasing power of our Chinese people requires consideration. I have found in China forestry practiced to a higher degree than I ever saw it in Germany. In certain regions silvicultural measures are reduced to proverbs, which indicates that forest practice has been going on for a long while. It is not the result of western science—it has been a product of necessity under certain conditions.

"There are thousands of cubic feet of timber rotting in forests in China. Forests are cleared away in certain parts of Shansi and are permitted to rot in order to get at the soil for food production. The primary purpose of timber cutting was to clear the soil for the production of food—not for marketing or use of the timber, although wherever possible timber is marketed. The former Manchu hunting grounds after the fall and inception of the Republic became public property. The farmers went in and cut down the forests and in many cases used large oak logs to terrace up the soil for the purposes of food production. Furthermore, the importation of western timber does not go far into the interior of China nor will it until better means of transportation are brought about. Most of the timber, the Douglas fir (or Oregon pine as it is called), does not get far out of foreign concessions. Practically all is used in building structures for use by foreigners or in foreign trade in sections where foreign interests have created the demand. I have not seen a piece of Douglas fir off the railroad or in the interior.

"Still another factor: more timber is grown in the great plains of China than is now used locally. Timber is actually exported from the great plain. I have pictures of logs along the railroad which were to be exported. The wood of the Paulownia is exported into Japan for the making of sandals. The Chinese people have reduced their timber needs down to a point which we would not think of—they have reduced their needs to the extent to which they grow timber. They do not grow timber on the great plain in forests but in village trees. The wealth of the village is often indicated by the size and number of its trees. During famines the village inhabitants have been known to sell their trees, which serve as a savings bank, to buy food from the outside. Trees have been actually given to bandits to ransom village members who had been captured by the bandits.

"The purchasing power of any nation depends upon its surplus food production. We purchase all things with food. The great famines in China and in Russia, more particularly in China, demonstrate that food is the thing for which people in the ultimate analysis will pay the most. When we stop to think of it, our civilization is based primarily upon surplus food. Surplus food releases portions of the population for other purposes than food production. Because one portion produces more food than it needs, it liberates another portion to engage in manufactures in cultural and educational pursuits. We ourselves are here

because of surplus food produced by others. About 70 to 85 per cent of the population in China produces the food which the country uses. In this country between 30 to forty per cent of the population produces the food we need. For that reason there are liberated in America a large proportion of our people for the cultural and manufacturing pursuits. As a consequence of this we have at the present time the highest standard of living of the world and probably that we will ever know, because as the population increases our standard of living must go down. We now have the opportunity to command more of the good things of the world than any other people. Because of her great population, China will have a great purchasing power but she will be unable to purchase anything like we can on a per capita basis. Even with the laboratory going into China, I doubt if the food production of the cultivable land area will be increased much more than 25 per cent; for the carrying capacity of the land in China has pretty much reached its limit. China is too overstocked for a standard of living such as we now have. It is impossible to translate our standard of living to China. As our population increases and the portion which is dependent upon surplus food is decreased, our standard of living must also go down. I feel, in regard to our timber industry, all we have need to do is to wait. As the population increases and demands increase, and as the supply decreases, we are going to get to the point when we will pay a lot more for timber and use a lot less of it. Let the lumber industry take its losses now in scrapping a part of its surplus saw-mills: it will not lose in the long run."

Kirkland: "I think that the principle of taking the cut in the right quantity and in the right place is being violated by the lumber industry to a large extent. The lumber industry admits that it is taking the wrong quantity. It is taking so much that it gets less for its production. Last year we saw a great cotton crop in the South. It was apparently too large a crop for immediate marketing. The price was depressed by the pressure for the marketing of the crop and the return was less than this year with a smaller crop. So the lumberman, by taking too great a cut from the Pacific Coast forests, has reduced the total return from cutting operations. Also, he has violated good forest management and good economic procedure by taking his cut in the wrong place.

"The lumber industry pursues the practice in Washington and Oregon of going into the forest under the belief that they want to save everything; they cut trees that are making profits and they cut stands that make losses. Every forest that is cut at a loss is decreasing the net returns from the cut in this region and decreasing the ability of the forest owners to carry the investment and secure net returns on the investment. It is an absolute fact that lots of stands are being cut in Washington and Oregon at a definite loss—the return is a negative return. On the other hand, there are stands that could have been cut at a profit. I say stands, because I do not think that in western Washington and Oregon we are able to cut on the selective basis in most forests, not because it would not be all right to save the small trees. If it were possible to cut the old and save the undersized trees, I think that would be the thing to do. But I do not think it is possible to cut without smashing up those trees and our problem is a problem of selecting stands in which there is a minimum of trees of uneconomic sizes and then utilizing closely those stands we do cut."

Cecil: "We know that the average lumberman, while he might like to follow Mr. Kirkland's suggestion, is concerned largely with where he gets the next dollar. He cannot wait. On the other hand, the public and the nation cannot wait until the timber supply is exhausted before the practice of forestry is begun. I think that Colonel Graves has the only reasonable suggestion and that is the action by the public and by the Federal Government in the solution of the question. I believe, however, that the temper of the people of the United States is such that any crystallization of the problem, as it is now before us, will receive the support of the nation as a whole. I do not believe that there ever was a time when there was such a strong sentiment, as there is today in the United States, in favor of conservation. I get that reaction not only from my own community. Take for example, the American Legion. The thing is sold to them. If it is sold locally, it is sold nationally. I would like to see something real in the way of a national movement that we can tell these various organizations to get back of. They want to do something. We can give them some little job, such as securing larger appropriations for the State Forester, but that does not answer the thing for them. We have sold a big problem to them, in a big way, and they want a big answer to get back of."

Fritz: "Trade extension was mentioned by a previous speaker. I have been wondering if foresters have given proper thought to the possibilities of trade extension in the lumber industry—as to its value in forestry. I had the pleasure of becoming rather intimately acquainted with the promotion campaigns of three organizations the past year and was impressed with the great potential value of these programs to secure the practice of forestry. For every meeting of this Society—once a year—there are probably fifty other meetings in the country that are designed primarily to take away the market of the lumber industry. Some of the methods are very subtle in the way they are worked out. It is a rather peculiar situation that we should be meeting annually to talk about forestry and making the way clear for foresters, the while permitting a larger number getting together to take away the market for the product we are trying to grow, without objection from us. It is not consistent. I want to urge our members to get acquainted with these programs and to give them their wholehearted assistance.

"I learned recently of a most subtle method to get our markets away. Sometimes the vocational training and manual training teachers have conventions like we. At these meetings are exhibits of metal-working machinery manufacturers. Some of these industries have been able to get men on the program to tell these vocational teachers to take word back to their school boards that they have got to 'get on the band wagon of steel, that the day of wood is past.' Last week in Chicago I attended a meeting of the American Petroleum Institute. Here I saw another indication of the capture of an important market. I was there for the purpose of seeing what we could do to get these people to continue the use of wood around oil fields. I was surprised to learn from one of the committee members, 'What is the use of talking about wood? The day of the wooden derrick is over—anybody that uses a wooden derrick is considered old-fashioned.' We had quite a long discussion. It did not take long before we convinced him that the merits of the steel derrick may have been over-

sold, and that wooden derricks and rigs have certain advantages which had not been brought out. It developed that perhaps the steel derrick has prospered at the present time not because it is better but because the man who manufactures steel derricks is a better merchandiser than the lumberman. This was a very excellent illustration of what trade extension can do to save a market for wood. As a result a sub-committee was formed in the American Petroleum Institute to study the virtues of wood and to draw up standard specifications. Another instance: at Signal Hill, in Los Angeles County, on Monday, the town council is going to meet to consider drawing up a law to prohibit the use of wood in oil rigs and derricks. You can see how it is going on all over the country. If that continues we are wasting our breath talking about forestry. After a while we won't be able to sell enough wood to make forestry pay. I want to beg you foresters not to overlook these trade extension programs. Get behind them and help them along. It will help you also."

Granger: "Is one of the speakers allowed seconds on this program? I have listened to what Colonel Graves and Mr. Cecil had to say of the need for a national program. It is not clear to me just what that would mean in specific terms of growing trees on the land if that land is going to return a profit. The country as a whole is not suffering materially because the timber in the Lake States is practically exhausted. The nation is not suffering because New England cannot grow trees in competition with west coast woods. The country, as a whole, is not suffering because of the over-production of west coast fir. The Lake States *are* suffering in losses of communities which have passed out with the depletion of the industry. New England *is* suffering in a large local way. And this country out here is going to suffer very severely if the forests, which occupy one-third of the land area of several states, are not replenished and do not serve as a basis for a permanent industry, on which such a large proportion of the population depends. What kind of a *national* program can we support which will translate itself into specific things to do so that the owners of this large private acreage, which can grow nothing but timber, will be able to grow new forests on their land in perpetuity? It comes down to a specific problem which cannot be answered in terms of National policy. If the proponents of a national policy have some specific answer to that it would be desirable to have it brought out more clearly."

Carpenter: "We can lay down certain broad major principles and do certain broad things on a broad scale, but always we come back to the necessity of working out a policy that fits individual localities. If we can answer the question in one locality, and then in another, we can answer it fully after a time. We will then come much more close to solving the whole problem. In New York the Section has had a committee on state forest policy for some time. They have been working earnestly to solve the problems inherent to New York State. In New York we have something that has been frowned upon in other states and frowned upon in New York by certain interests. We have a state forest preserve of more than two million acres. In 1893 when they revised the State constitution they wrote into the constitution a provision that the land of the state now owned or hereafter acquired shall not be leased, sold or exchanged nor shall timber thereon be cut, removed or destroyed. In the Adirondacks, if you

cut down a balsam to make a bed, you will have to pay the state a fine. You may cut some limbs but you may not destroy the tree. There have literally been cases where a man has cut down a little balsam and has been haled into court for cutting the tree. That provision was written into the constitution in 1893 because for a long time lands had been seriously devastated and the public began to see what was happening and rose up and put that prohibition into the constitution, and also stopped forestry as an economic undertaking on the state's lands except insofar as the forest has an economic value for regulation of stream flow. Since that time there have been repeated attempts to repeal or modify that section of the constitution and it has always been voted down. About 1916 after many attempts, the state passed a bond issue of 7½ million dollars to buy more land and it passed by a larger majority than any other bond issue, not even excepting those for good roads. There is public interest! In 1921 or 1922 they passed another bond issue of 15 million dollars for state park purposes. Only by the narrowest margin has New York refrained from regulating the practice of forestry on private lands. The state nurseries have been increased tremendously and only a few years ago they passed a law through the legislature making appropriations for the giving away of free trees to anybody who would undertake reforestation. I do want to bring out the point that the people of New York State would not let their own timber land be devastated until the lumber companies could show that they could handle their own lands in a way that would warrant the opening up of state lands to use. They have passed bond issues to increase the forest preserve, and give away trees for reforestation. Now the forest policy is being still further worked out, chiefly by technical foresters. The thing that is uppermost in my mind during this meeting is that it is being crystallized actually and literally through the brain power and constructive effort of the New York Section of the Society of American Foresters. They are solving the problem in New York State, and I think I can say without any reservation whatever that they are doing it point by point with absolutely complete public confidence and co-operation. As it is being worked out in New York it is going to be worked out eventually in state after state."

Graves: "We have here a national problem and it should have the sympathetic consideration of the whole country. It is not a local problem. The industry has gotten into serious difficulty and may properly appeal to the nation. Here in the West exists this great reserve body of timber in which the nation is interested. Its proper use and development is not a local question. The oil people are getting the nation's interest in their problem. The coal people have come forward and said, 'We can not handle our problem alone.' I would like to know how the lumber industry on the coast is going to be able to handle its economic problem without public co-operation. I believe that the whole nation would be interested and would be ready to support a constructive policy that will help to solve the present situation. You may have to do something a little different from what is usually proposed. I feel perfectly confident that the sentiment of the country is sufficiently advanced to view this matter in a constructive and not in an obstructive way. I believe that it can be done."

Black: (From the discussion following S. B. Show's paper in the February JOURNAL OF FORESTRY.)

"The term 'industrial forestry' has been used synonymously with 'crude forestry,' and then again with 'sustained yield.' I doubt that either use is quite correct. Sustained yield may result from the practice of industrial forestry in some instances, but is by no means essential to its practice.

"Crude forestry was well defined by Mr. Show as land management that leaves most acres in such shape that they will grow trees of some species that will make a future logable forest.

"Applying this measuring stick to our California Pine cutover lands as they are now being left by the industry, I feel that we have been given a pessimistic viewpoint of the situation. To practice crude forestry in our pine region three things are necessary according to the previous paper; first, fire protection, second, leaving 50 per cent of the advanced growth; and third, leaving of seed trees.

"I still think fire protection is fully 85 per cent of crude or industrial forestry in this region, and the industry is protecting all forest lands, timbered and cutover from fire. There is a state law requiring this in the pine region. Few if any other states can show as satisfactory a fire record as this. The major requirement of crude forestry is being well taken care of by industry in California.

"The second item, leaving 50 per cent of advanced growth, is also well on the road to accomplishment in the majority of our operations. Even in some of our high lead operations fully 50 per cent of the advance growth is left standing, the operation in which Mr. Berry, the previous speaker, is interested, being an outstanding example, but not the only one. However, it is not to the high lead operations that we are looking when mentioning the general practice of leaving a high percentage of advance growth. Such results are being obtained automatically from the use of tractors in logging. Last year, half of all pine logging in the state was done by tractors. The method is gaining in favor through the economies the system offers over other methods.

"There are some companies that now cut nothing less than fourteen inches in diameter, and this practice is spreading. It will increase as has the use of tractors because it is more economical to leave the trees than to cut them and manufacture them into lumber. Combine the use of tractors with 100 per cent fire protection and you have gone a long long ways in securing for the future a logable forest of trees of some species on most acres now being cutover. I have already stated that our lands are given the 100 per cent fire protection and that some 50 per cent of all logging is now done by tractors. Add to those operations the few donkey operations where for various reasons 50 per cent or more of the advance growth is preserved and the picture of the productiveness of our cutover lands in California is hardly a gloomy one.

"The fact that the intent of the company may not be deliberately one of raising a forest for the future in accordance with some specific plan, does not to my way of thinking disqualify the raising of the trees as being industrial forestry. It is sometimes difficult to sell to the operator, forestry as a 4 per cent investment, when his last bond issue was $7\frac{1}{2}$ or 8 per cent. It is not difficult to secure improved forestry practices when you can show a saving in operation cost thereby. Fire protection was adopted for all lands purely as an economic saving to the land owners. Tractors are being used on a large scale

because they save money over other systems. Trees up to 18 inches in diameter will be left because money is saved in leaving them. The result of these measures adopted for economic reasons, is a leaving of cutover lands in such shape that they meet to a very large extent the requirements set forth in Mr. Show's definition of crude forestry."

Metcalf: "We have 4 million acres in California of woodland on farms. The most important part of it is in the pine region. It is a very serious problem from a community standpoint. We have been talking about national and state forestry. Mr. Granger mentioned that it was a community problem or a regional problem.

"I think it is a smaller unit than that. I think it is a community problem. You will see that we are sinking our foothill communities, irrevocably in many cases, because fires and because of the lack of appreciation on the part of the foothill people of the importance of these second growth stands. It is the optimum region of yellow pine in California. We have a great conflict of interest between the timber growing on those lands and their use for other purposes. I know because I presented it to the agricultural representative of the foothill yellow pine counties. I realize the difficulty of it, in getting into the conscienceness of the people an appreciation of the timber there that the pine timber which has practically no value today has any function in the future well-being of those foothill sections. I consider this one of the problems of industrial forestry in the yellow pine region."

Winkenwerder: (From discussion following paper by C. S. Chapman in the February JOURNAL OF FORESTRY.)

"A point which I would like to emphasize is that the foresters throughout the country should take more interest in the question of utilization. If you do not have a market for the products of the forest what will it profit anyone to go into forestry practice. You are going to have to consider the market for your product as much as you do silvicultural management or anything else. In talking with one of the representatives of the Lumber Trade Extension Bureau I was told that in spite of the fact that we have had an increase in population from 1910 to 1920 the per capita consumption of wood dropped from 500 board feet in 1910 to 425 board feet in 1920. At present it is again up to 345 board feet per capita. In spite of the fact that we have increased ten millions in population, that increase has not taken care of the comparative reduction in the per capita consumption.

"If any forester is in touch with the situation in the lumber business—in the marketing end—he knows that substitutes are making rapid inroads on forest products. I believe this organization should at this meeting take some steps which will look into the question of doing all that it is possible to do to increase or to hold the market for forest products. You are as capable of handling that question as any other organization. I probably am personally not quite as skeptical of the future demand for the Douglas fir timber because among other things the pulp industry is developing by leaps and bounds. Almost every week we have heard of some new project. That, of course, is going to mean shorter rotations on certain lands, and possibility of thinnings. We shall see development going along the line of what is being done in some eastern com-

munities. We are going to be utilizing our material much more closely. We can clear our lands to much better advantage and thus give us much better conditions with reference to fire protection, and which will mean a larger profit to the forest. When it comes to the question of the practice of forestry in private lands the first question, as you know, is what are the profits. If we can increase those profits it affords much better opportunity for the practice of forestry on private lands."

MacDaniels: "There are about 3 million acres of timber land which were included in the grant to the Oregon and California Railway in Oregon. Title to this land was vested in the government after a long suit. According to the terms of the revesting act, land with less than 300,000 feet of timber to the forty-acre subdivision was classed as agricultural and thrown open to settlement. Land with more than 300,000 feet to the forty acres was classed as timber land and cannot be sold. The timber on it is for sale, however, and when the timber is removed, the land is automatically reclassified as agricultural.

The greater part of the grant remaining in the railroad's ownership at the time of the suit was settled in the Government's favor, was rough mountain land. A large acreage was classified as agricultural because the timber had been burned. Some of the cruisers who were engaged in classification startled the land office by calling it 'agricultural land but absolutely worthless.'

"Through an agreement between the land office and the Forest Service, the latter handles the protection of the grant. In general, the units inside the National Forests are protected by the Service, and the remainder is contracted to the state and associations organized for protection of private timber.

"Protection is made difficult by the terms of the act, and by the method of making sales of timber. State laws for protection and slash disposal cannot be fully applied on these Government lands. While the sale agreements provide for slash disposal, there is no bond or other provision for securing compliance, which depends largely upon the persuasiveness of the local warden and the operator's good nature.

"A very small part of the land classed as agricultural is actually suited for that purpose. Nevertheless, large areas are taken up by inexperienced people, who in many cases start a clearing and after an effort to make a living, starve out and abandon the claim. The land office records show instances of 5 applications for the same unit in 10 or 12 years.

"If the applicant can hang on long enough to get title, the situation may become even worse. As long as title to the land is in the government, protection is provided; when title passes, the government has no further obligation. This is the type of land that cannot pay taxes; it is frequently abandoned and makes the delinquent tax problem that much worse. Very large areas have passed to private ownership of a class that is unlikely to keep it up, and fire wardens look on the present situation with great anxiety. There is urgent need for improvement in the way in which these grant lands are being handled."

Peavy: (From the discussion following D. T. Mason's paper in the March JOURNAL OF FORESTRY.)

"Mr. Mason's paper is a fine presentation of facts and with his facts I have no quarrel. Sometimes, however, we appear to have our objectives

so fully in mind that we neglect the obstacles which must be overcome before the objective can be attained. We have a deal of underbrush to clear away before the big fellows in the timber game can see the sustained yield goal. There are a whole lot of things which, as foresters, we should be more active in doing than we are now. In Oregon, where I have had eighteen years of forestry experience, I think we should go out for a thorough-going land classification program. I do not think we have any business trying to formulate a state forest policy until we know pretty definitely what we are going to work with. We should know what land is forest land and what land is suited to other uses. The profession should get behind the land classification program and see it through.

There are still too many uncertainties connected with the industrial forestry game. I do not believe many prudent business men are going to put good money into long-time forestry investments until they have reasonably definite assurances concerning costs. Except in the case of going concerns with stumpage available for a period long enough to assure the maturing of other timber crops, I do not feel that owners of forest lands are going to be sold to the sustained yield idea until a tax program has been worked out and enacted into law which will guarantee that the major portion of the tax will be collected when the timber crop matures and is harvested. In Oregon we have been working on this tax proposition several years, but satisfactory legislation has not yet been enacted. The California law is a great stride forward. In tax matters the State must go into partnership with the private timber growers.

Protection must be intensified and modified. Forest properties must be made insurable risks if business men are to carry these properties over long periods, thus accumulating high investment charges.

"As far as private forestry is concerned, industrial forestry is about the whole thing. The whole idea must be sold to the people. Tax reform will follow only when public opinion demands it. Public opinion is pretty well behind the protection of forest properties because foresters, in season and out of season, have played up the menace of forest fires. This same energy must now be directed to other phases of the forestry program. We have made the people forest fire shy. We can make them forest minded generally. We spend too much time talking forestry to each other and too little time talking about it to the voters. In the last analysis the people must decide. We can put over a program by aid of a minority, but we cannot sustain a program without the support of a majority.

"We cannot question the outcome. An area of 470,000,000 acres of land good for nothing except growing tree crops is an unassailable forestry argument. This land will be in forest and on a sustained yield basis. I think we will pave the way for industrial forestry. It can be made a reasonable investment. The balance of private enterprise against public effort in forestry is wholesome. Sustained yield? By all means. Industrial forestry on a big scale? Maybe."

Metcalf: "Californians are proud of the Redwoods. If there is one thing for which California is known throughout the world more than any other thing it is the presence of redwood trees. This introduces into the problem of the management of redwood lands some considerable complications. Because of the high recreational value, because of the great interest which is attracting, has

attracted, and will continue to attract people from all over the world to the redwood region just for the pleasure and privilege of seeing the trees, we have this problem introduced into the region. As an evidence of the fact that the state itself is greatly interested in the preservation of tracts of redwood timber, you have the expenditure made by state appropriation of three hundred thousand dollars within the last five years for the purchase of virgin redwood tracts for state parks. You have a proposal before the people coming up within the next year for the expenditure of \$6,000,000 for additional purchases of redwood tracts for recreational purposes. Foresters have been charged by those outside of California as not being greatly interested in this recreational program in the redwood region. That is not the case. Foresters have been as much interested as any one else. I think we have overlooked, and I think that the people are being led to wrong conclusions, in connection with the recreational value of these tracts of redwood, particularly in connection with second growth. Personally I think it is a splendid thing for the state and the nation and friends of conservation and parks, to get behind and work for the setting aside of splendid virgin tracts of redwood timber, but I think that we as foresters should be much more interested in the building up of second growth stands and the demonstration to people that second growth redwood stands are as desirable or as beautiful and more interesting than the virgin stands themselves. We already have in Sonoma County where the early cuttings of redwood took place, a recreational area on the Russian River, that depends primarily for its interest, for its recreational value, and for its scenic qualities on second growth redwood. There is no virgin timber on the Russian River outside of that in the Bohemian Grove, yet I doubt very much if 10 per cent of the people who visit the redwood region in the summer time realize that the trees which give the quality to the scenery along the river are most of them less than sixty years old."

MacDaniels: "I am curious to know whether or not the situation in the Douglas fir belt is adapted to the practice of forestry. The amount of money spent for fire prevention has trebled in the last twelve years. Improved organizations and personnel, better equipment and methods have made the present force, man for man, twice as effective as it was 12 years ago. Nevertheless, the number of fires and the area of forest land burned over remains about the same. The improvement in methods has just about kept up with the hazard. The annual loss by fire is still between 1 and 2 per cent of the area protected. This is probably too much to permit the success of sustained yield.

There is a limit to the amount of money that can be put into protection. Perhaps the example of limit to which protection can be carried occurs in the white pine region in Idaho. The Clearwater Protective Association, for instance, spends about 10 cents an acre for prevention only. If fires occur, as they do, enough more is spent to put the fire out. Costs may run up to 20 or 30 cents an acre in the white pine belt. The values warrant their expenditure. It is unlikely that cutover Douglas fir land can stand this expense. It is not reasonable to expect companies organized for the purpose of lumbering and if possible making a profit to change their organizations and become land-holding and timber-raising companies without some good incentive. When they are operating at a

small profit or at a loss, as many of them are, it is not likely that this change will be made.

Overproduction is said to be the main reason for the situation. Overproduction seems to be getting worse. Small sawmills are increasing by hundreds. That does not look as though the overproduction question would be settled in a hurry. I am at a loss to know how to make an attractive figure of forestry in Douglas fir."

Munger: "In partial answer to Mr. McDaniels, I think it should be remembered that most of the big companies in the Douglas fir region are already undergoing the major expenses of forestry by holding their lands until they are through with the complete operation of their tracts. They go to the expense of protection on the entire tract for perhaps 15 years after it is cut over, and pay taxes thereon, yet are not getting the results we would like. Now the question is—can they afford *not* to spend the few hundred dollars necessary in addition to get results, rather than spend three-quarters of the cost of forestry and not get results? It is the offsetting feature of sustained yield, namely the saving in depreciation charge, which in some regions largely offsets the cost of reforestation. One other point—in spite of these notes of pessimism, the people from each region indicate that industrial forestry is coming on. In each report there are some outstanding instances of companies that are going ahead and growing second crops. The problem is coming along. But we do not want to simply let it take its course. We want to *lead* it forward. I hope that before this discussion is closed, there may be some very specific suggestions as to what the profession of forestry should do to move industrial forestry along faster.

"Foresters should work for classification of land, better protection, better publicity. They have got to be open minded to the realization that forestry in the West, in these great mountainous regions, has got to be in large ownership. We can not expect the small owner to practice such forest management as we need here. Therefore, foresters should be favorable to the consolidation of large holdings, and it may be that Federal legislation is necessary to allow the mergers and consolidations. Of course I am very firmly sold to the idea that we are lacking in some of the necessary information to put practical forestry into effect. Most of the papers have called attention to the need for more forest research."

Mason: "There are one or two points I would like to speak on. Mr. McDaniel misunderstood the paper. I didn't say that there was a better opportunity in the redwood than in Douglas fir. We think they are both real good. Dean Peavy points out that there are a great many different obstacles to be overcome before a business man would be justified in investing money in forestry. I think there are other ways of looking at it. We have found that in trying to promote the sustained yield there are a great many suggestions as to what ought to come first. Land classification of forests undoubtedly is first. We ought to have a lot better tax law in general than we have. The redwood people started making revision in the tax laws. That is true in other regions also. If we were going to start any other kind of an enterprise we would anticipate that the public would deal fairly with us. The fact that we start and show good faith,

then this tax question ceases to appear to the public as a bogey that we are putting up. We will get more real sympathy in the matter of taxes if we are actually doing something that needs relief. Mr. Munger brought out that there is a lack of information. There are many things that need doing. To my mind they will be done most effectively by people who are setting out on projects that require that they be done. If we wait until every condition is made perfect for private forestry we are going to have a nice long wait. If we get busy on it, the people who are doing it are going to see to it that these things are done. One suggestion I have heard was that sustained yield is a fine thing, but it should be tried out somewhere else first, in some selected locality. That would be the proper thing to do, if we had time. The most important thing is the time element. If we just sit around waiting to get things perfect, we won't have anything to work with. We have got to get to work right away. Time element is immensely important. I apologize for taking so much of your time—perhaps offering entirely too much criticism, but I want to say that I do it with the best spirit and am sure most of you realize it is done in a friendly spirit. I believe in telling people straight out—fighting the thing out, then getting together all the results."

Morrell: "Just two points that I want to touch on. The first one is that speaking for the white pine region I think we ought to be very honest with ourselves on the point that Mr. Show made yesterday, that if there is practice of forestry we should see evidence of it in the woods. I don't think we ought to be led away from seeking the evidence of the practice of forestry in the woods by the idea that we are making some progress. The white pine in private lands in Idaho is being cut over very rapidly. It is only going to be a few years until most of it will have been cut over and the evidence of the practice of forestry in the woods, considering the length of time under which the land is going to be cut over is not, in my judgment, a thing to look at with any great degree of enthusiasm. Progress is slow considering the length of time before the whole thing will have been cut over. I want to touch on the one point that has been mentioned several times, the criticism of the statement that forestry is 90 per cent protection. Surely, before any commercial organization can start out with a big investment on a project that is going to take years and years to carry through they must have an insurable risk, something that they can place in the hands of somebody who can carry the risk for them, or must feel some assurance that they have an insurable risk. I do not think that is answered by those averages, that 1 per cent to 2 per cent of all lands in the white pine region burn over once each year. Life insurance is not answered with the question of averages. The question is will the fellow who is putting up the money—will that one per cent concentrate on him. If it does, he is going to lose his whole investment. Some concerns have lost so much that their investment can practically never be brought back to a profitable state. The fellow who is going to put up his money is going to look at that particular danger and not be content on the basis of averages. I do believe that a guarantee of protection from fire is worth about 9 times as much as anything that silviculturists have to offer in the way of insurance—in the way of doing something that will bring back to that investor his

money and some interest on it. I believe that any forester who goes into a region without taking these things into account and is advising any sort of practice which may accomplish other things in forestry, but which will leave out of consideration the thing which will go farthest towards insuring that property against protection, is on very dangerous ground. I believe that so far as the white pine region is concerned, protection against fire loss of young growth and old growth can thereby do 9 times as much good as any sort of other practice the forester might put into effect."

Mulford: "Why cannot the Society pick a carefully chosen committee, very carefully chosen, of men big enough to approach the lumber industry in something like this frame of mind—'we realize the obstacles you have to contend with. Only by concerted action by you, by us, by the public can we find the solution, if there is one, of this problem of financial over-burdening of lumber industry as it now stands.' Only by such co-operation can we work out many other problems which are necessary if we are to have real industrial forestry on a big scale. Time is the element. Why do we allow things to drift on any longer. And in that I do not mean to imply that things have been idle. The time is here now, when, in a big way, a committee of the Society of American Foresters can work with the proper group of lumbermen, and with other groups as needed, in formulating now a comprehensive industrial forestry program."

Zon: "This meeting has been proceeding too tamely to suit me. I can't help contrasting two meetings on industrial forestry. One was held in Chicago a few weeks ago. The papers were prepared by lumbermen themselves. The rule was to keep foresters off the program. Dave Mason sneaked in. The meeting was initiated and carried through by lumbermen. The spirit was remarkable; there was a tone of optimism. I came here to this meeting—not of lumbermen, but of foresters. There were good papers in spots, but if you will analyze the general tone of this meeting, it is permeated with pessimism—impossibility to do certain things—go slow—we are afraid to tackle the job.

"I know of at least two cases where lumber companies wanted to go ahead and thought that the best thing for them to do was to employ a forester, and after they employed a forester, he was the worst drag in the works. He was always afraid he would do something, and keep them back. I know of two cases where lumber companies have asked foresters to come and make working plans for them and those foresters have lost the job because they were too timid—they were afraid to come out boldly and tell them something needs to be done. They thought it was so radical. I do not know what is the matter, really. It is not the lumber industry. We used to think the lumber industry was keeping us back. We are too timid. We talk and are afraid to tackle the job when it comes to us. Suppose the lumber industry would be willing to go ahead tomorrow. How many of you foresters would be ready to tackle the job?"

Granger: "I hate to see a man get away with too much. We heard yesterday that an expert was just an ordinary guy a long way from home. I have also heard the definition of a specialist—that he is a man who knows

more and more about less and less. I do not take it to be the sense of this meeting that industrial forestry is hopeless, that the outlook is dark, nor was it my purpose to give the impression that forestry in the West is not a matter of national importance, but I believe Zon himself has, in the columns of the JOURNAL, expressed the idea that if public speaking and resolutions by luncheon clubs and other organizations could do any good, we would have forestry throughout the country. He has not relied upon oratory or the passage of resolutions to stimulate forestry in the Lake States. He has gone with his staff, made studies, measurements and calculations and has been able to lay before the lumbermen of the Lake States proof that it means more money in their pockets to cut the big trees and leave the little ones to grow. When you get down to brass tacks, foresters have got to do just that with the lumber industry, and not rely on spreading more of the national propaganda which concerns itself with the general statement that our forests are being cut four times as fast as they grow or that a timber famine is imminent. That is the reason why I say that if we are going to convince the lumbermen, who are in the woods where forestry can be practiced, and if we are going to convince the people who have to do certain things to aid the lumbermen in putting forestry in the woods, we have got to come down to the local aspects of the problem, down to where the trees are. I should hate to see the feeling carried away that foresters themselves are either afraid to tackle the job or do not see any hope in the future for industrial forestry."

Koehler: "In listening to these discussions during the last few days and also to the papers presented at the Commercial Forestry Congress in Chicago, I was impressed with one fact, and that is that the discussion of profitability of forestry seems to hang upon what it costs to produce the forest. Now there is undoubtedly another angle to the profitability of forestry, and that is what you can get for the stuff after it has been grown. Doesn't the question of whether it is going to pay to practice forestry depend just as much on how you can dispose of the forest products afterwards? That is just the thought that I want to leave here.

Surely the crop of a forest is not fixed in value. You can get only so much for it. I believe firmly that the value of the product can be increased considerably by proper methods of silviculture and utilization. You all know the story about the waste in the sawmills. There are other means of increasing the value of forest products besides utilizing waste. One is by growing better trees which are particularly suitable for certain purposes. Another means is selecting and grading our lumber products to a much greater degree of refinement than is done at the present time, so that the lumber will be graded for properties as well as defects, and if that is done, it will bring a better price, with no disadvantage to the consumer. The third point is that the quality of lumber can be improved—after it is cut. That is something that we have done very little about. Why cannot the surface of our western soft woods be made harder so that they would wear better? Why couldn't a number of things be done with lumber to improve the quality? Let no one say that these things cannot be done, lest someone do them tomorrow."

Sampson: "Mr. Zon mentioned the water requirements for the production

of a given amount of material of wood. A few years ago an interesting experiment was conducted along this line. We found that in working with soil which had been eroded and not eroded—growing plants in these soils in cans and measuring all the water that was used in the production of plant material—we found that, when the soil was not eroded, it required 600 pounds of water to produce one pound of grass material. Where the surface soil had been removed, it required very much more water—200 or 300 pounds more of water to produce the same amount of material. If there is a small amount of food material available to the plant, it must have more water to produce a certain amount of material. It seems to me that there is quite a fundamental principle here. In the first place, when the surface layer is removed you immediately cut down the water holding capacity of that soil and it is not possible for the higher type of vegetation to grow on that soil, but a lower type is introduced—a type which can complete the cycle of growth in a short time.”

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WHAT IS INDUSTRIAL FORESTRY?

Comment on Editorial, Journal of Forestry, Volume XVI, No. 1—1928

By E. F. MCCARTHY

Central States Forest Experiment Station

The editorial on the first page of the January issue of the JOURNAL OF FORESTRY attempts to define a new variation of forestry. It seems that the entire subject would be simplified if forestry is defined as such management of timber lands as will result in the establishment of a normal growing stock consistent with the purpose of management and the rotation.

It must be recognized that foresters have lost sight of the important relation which the growing stock bears to the possibility of production. No forest is in its best producing condition until an adequate growing stock has been built up. This growing stock will of course vary according to the intent of the owner and the length of rotation, so that every owner must have a plan of management which will take these factors into consideration before he is in a position to state whether his present woods practice is building up or destroying his growing stock. This, to my mind, is the sole measure of the adequate practice of forestry and I see no reason why it is necessary to qualify it with such adjectives as "industrial."

The reason for making this point at this time is because there is a general lack of understanding that the growing stock is an essential part of the investment in any forestry undertaking which seeks profitable production.

WHERE CAN TIMBER BE GROWN COMMERCIALY IN
THE UNITED STATES?

*Comments by A. E. WACKERMAN, Forester,
Crossett Lumber Company*

From an analysis of a group of timber yield tables and the yield of corn, wheat, apples, and peaches, K. W. Woodward, in his article, "Where Can Timber Be Grown Commercially in the United States?" in the January JOURNAL, concludes that nearly all the forest regions of the United States *are worth considering from the standpoint of rapid timber production*—except the South, although he does list the cypress-hardwood bottoms as productive.

Such an unusual conclusion justifies careful inquiry into the source of his information and the correctness of his interpretation of the facts. Since the author of these comments has seen some of the East and much of the Lake States in his forestry experience and is now planning the forest management of a commercial forestry enterprise in southeast Arkansas, he feels justified in pointing out some deficiencies of facts and faulty logic in Woodward's article which invalidate his conclusions with respect to the productiveness of southern forests.

First let us consider his basic facts. Normal yield tables were used to compare the productivity of different species by regions. In general, it is a

safe method, provided only that the tables are comparable and that all available information has been used and the interpretation of the statistics is tempered with judgment. It is presumed, or hoped, that the tables used are correct, although many of them are antiquated. With respect to the South, however, he has not included the most recent and best yield tables for southern pines prepared by the Southern Forest Experiment Station. These tables when included in Woodward's tabulations give an entirely different complexion to his conclusions.

An investigation, the conclusions of which, if accepted as true or anywhere near the truth, might have such far reaching effects as to divert forestry and capital away from a great and important timber region, calls for a diligent search for facts. The Southern Forest Experiment Station would, without doubt, have furnished these latest yield tables for southern pines in mimeographed form and perhaps other valuable information merely for the asking. Likewise, there is no reference in the article to some of the more recent yield studies of the northern forest experiment stations, such as the yield of spruce by the Northeast Station and the yields of jack pine and aspen by the Lake States Station. Such serious sins of omission of available facts, even though not in published form, cast doubt on the thoroughness of Woodward's search for information. Had he intimated that his conclusions were not based on adequate data or that further careful study was needed his statements would be less subject to criticism.

The southern pine yield tables, unfortunately, are presented in from five to eight site qualities depending upon the species. However, for purposes of comparison with Woodward, an average of the best sites is taken as site quality I. The yield is in total cubic feet of stemwood per acre, *not including bark*.

By substituting for the old data on southern pines in Woodward's tabulation, the information from these recent tables, the following changes are noted. The figures in parenthesis after the species' names indicate their position in Woodward's tabulation and those after the figures give his data for that species. The asterisks merely indicate the southern pines for easy reference.

DIAMETER IN 50 YEARS

Inches

Red alder (1)	15.2	
Yellow poplar (2)	15.0	
*Loblolly pine (3)	14.1	(12.7)
Sitka spruce (4)	12.0	
*Slash pine	11.4	(Not included by K.W.W.)
*Shortleaf pine (6)	11.2	(11.2)
White pine (7)	10.8	
*Longleaf pine (5)	10.5	(10.5)

For diameter there is but little change in order in the revision. Longleaf pine is lower in the scale but its place is taken by slash pine which Woodward did not include. The southern pines are well up near the head of the list in diameter at 50 years.

HEIGHT IN 50 YEARS

	<i>Feet</i>
*Loblolly pine (2)	110 (87)
*Longleaf pine (8)	100 (78)
Red alder (1)	95
*Shortleaf pine (12)	90 (66)
*Slash pine	90 (Not included by K.W.W.)

The revised table for height shows the southern pines to occupy 4 of the first five places. The heights given are the average dominant heights, so average height of all trees would be somewhat lower. There is but little difference, however, between the average height of all trees and the average height of the dominant trees for southern pines at 50 years because, as Woodward has pointed out, the stands are not dense and there is little, if any, suppression; practically all the trees are dominant. This is indicated in the table of density where the southern pines occupy 4 of the last 6 places.

DENSITY IN 50 YEARS

The order of density after revision remains the same with the southern pines at the bottom of the list. Woodward, however, neglects to explain or take into account that density is a function of size as well as soil moisture. Because the southern pines are larger than the other species there are fewer trees per acre. That the stands are not so open that there is much sacrifice in yield is shown in the table of yields at 50 years. The southern pines occupy 4 of the first 9 places, being exceeded as a group only by 2 representatives of the northern forest (white pine and white ash) and 3 representatives of the western forests (redwood, Sitka spruce, and Douglas fir).

YIELDS IN 50 YEARS

	<i>Cu. ft.</i>
White pine (1)	8,800
*Loblolly pine (6)	8,400 (6,350)
Redwood (2)	8,000
Sitka spruce (3)	8,000
Douglas fir (4)	7,550
*Shortleaf pine (8)	7,300 (5,840)
*Longleaf pine (17)	7,150 (3,000)
White ash (5)	6,350
Red alder (7)	6,191
*Slash pine	6,050 (Not included by K.W.W.)

It is evident, therefore, that Woodward by omitting the most recent information on the yields of southern pines has painted a misleading picture, contrary to the facts and unjust to the southern pine forests. The yields speak for themselves. The southern pines *as a group* are well in the lead as rapid producers of timber. White pine, which heads the list, and white ash, which

is eighth, are the only representatives of the northern forests that compare at all with the southern pines as producers of timber. And redwood, Sitka spruce, Douglas fir, and red alder are the only representatives of the western forests to compare with the southern pines. What stands out most strikingly about the revised tabulation is the fact that the southern pines *as a group*, over the entire range of the Coastal Plain, compare more than favorably with certain of the most rapid growing species from other regions such as white pine and white ash. It must be remembered, in addition, that the yield tables themselves may not be truly comparable. The data, no doubt, favors the two northern species, white pine and white ash, because excellent second-growth stands are available for making fully-stocked yield tables while in the South the stands have been fire-ridden for so long that but few stands are left that even approach full-stocking and yield tables must be based only on present stands that can be measured.

There is little need to amplify the facts as shown in the revised tabulations. Rather let us look to some of Woodward's discussion.

In speaking on the density of northern and southern stands Woodward remarks, "*In other words a long growing season is usually accompanied by thin, open stands. Dense stands only occur in cool climates or where there is an abundance of soil moisture. . . .*" This statement implies that because the growing season is long in the South that the stands are open, yet his tabulated data shows the southern species to be larger than the northern species which, in itself, accounts, partly at least, for the fewer trees per acre in the South. However, there are other considerations. Fires burn the year around on the Coastal Plain and are largely responsible for the open nature of many of the southern pine forests. In the damp bottom-lands fire is rare and the stands of hardwood are thicker. Besides, the hardwood forest is all-aged while the pine forests are usually even-aged and tend toward more open stands.

Lack of soil moisture causes open stands only when moisture is the critical factor as in the western yellow pine forests of the Southwest. It is an established fact that for any species, jack pine in the Lake States for instance, the poorer the site the more trees per acre at a given age, and the poorer the site for jack pine the drier the soil as jack pine is a sandy-land tree. The denser stands in the North are more likely to be due to the slower growth and consequently smaller size of the trees than to a super-abundance of moisture and, in the case of hardwoods, to the all-aged form of the stands.

"*The species growing in cool climates lead those from the southern United States, especially if they also occur in regions of abundant precipitation. New England white pine, redwood, Sitka spruce, and Douglas fir are examples of this fact.*" However, redwood grows in a moderate climate not so different from that of the South, with cool moist winters and rather dry, hot summers. And Sitka spruce and Douglas fir can hardly be said to grow in a climate similar to that of New England with its rigorous winters.

To further his argument Woodward gives the yield of corn, wheat, apples and peaches per acre for northern, middle, and southern states. The yield decreases southward for all except peaches. From this he argues that southern climates are less productive, agriculturally. Granting that the intensiveness of cultivation and fertilization is the same in the northern truck farming region

as it is in the South among the many tenant farmers and negroes, it is not surprising that the yields of northern fruits and grains decrease southward. Had he taken the yield of sweet potatoes instead of corn, sugar cane instead of wheat, oranges instead of apples, and pecans instead of peaches, his data would have been equally as relevant though less to his point.

To illustrate the "fierceness" of erosion in the Southeast (the same applies to the whole South) Woodward points out that, "*There isn't a single natural lake of any size. There can't be. The barriers would be washed away.*" The South is indeed unfortunate in not having been glaciated so it could have lakes to demonstrate the moderate erosion of the Coastal Plain.

The movement of the kraft paper industry from the Northeast to the central South is no doubt disconcerting to some. But the Northeast has been so over-developed for paper and the South so under-developed that such a balancing movement should not cause uneasiness in the Northeast. Let us not become prejudiced, region against region. The South needs the paper industry since the market it offers for thinnings and for second growth, makes forestry more attractive.

Every region will produce some kind of timber at a profit and New England and the Lake States are particularly favored not so much by nature, perhaps, as by proximity to markets and technically desirable species such as spruce. However, the South also is richly endowed for timber growing, but rather with a benevolent climate and rapid growing timber trees and easy logging, than with markets close by. The South is unusually productive when rapidity of timber growth is considered. However, it cannot hope to meet the timber needs of the United States, but neither can it be ignored as a timber producing region.

New England is the cradle of real forestry in the United States and has had time to learn something about its own timber producing capacity. The South, on the other hand, has only rather recently been discovered by foresters and we do not know as yet from experience how well we can do in timber growing except that the South offers splendid opportunities for commercial forestry.

Woodward's conclusion that, "*Only the following forest regions are worth considering from the standpoint of rapid timber production: redwood, Douglas fir, eastern white pine (except the western margin where rainfall is deficient), beech-birch-maple, western white pine, and cypress-hardwoods (except the very wet black swamps),*" needs a great deal more evidence than he has presented to verify or even to justify it. Because it not only omits, but argues against the South as a timber producing region, Woodward's article is plainly either based on entirely inadequate information wrongly interpreted or it is prejudiced against the South or both.

HARDWOOD SAMPLE SETS

The Hardwood Manufacturers' Institute of Memphis, Tennessee, is preparing a collection of specimens of the various hardwoods native in this country. They will be made available in sets of seventy pieces, each piece measuring 5/16 x 3 x 7½ inches. Only a limited number of sets is being made up

because of the great cost involved, but reservations are being accepted at \$7.00 the set if sent at once.

FORESTRY AT THE ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The eighty-fourth Annual Meeting of the American Association for the Advancement of Science was held in Nashville, Tennessee, December 26-31, 1927. The Association has a membership of over 15,000 and there are 115 associated societies. About 2,000 scientists were in attendance at the meetings of the fifteen sections and thirty-five organizations represented at Nashville. While the Society of American Foresters could not meet with the Association this year, the Appalachian section held a meeting in Nashville on December 28. About 30 foresters attended, including members of the Appalachian, New York, Washington, Ohio Valley and Southern sections. After the section meeting was over, most of these men stayed over to attend the many meetings scheduled for the week.

One of the objects of the Society of American Foresters is to broaden our scientific viewpoints as professional men, and for this reason it pays us well to enlarge our contacts with scientific workers in other lines. By this means, also, we increase the knowledge of forestry among other professional groups, and increase the respect and sympathy of such groups for our profession. Hence we are pleased to note that foresters are showing much greater interest in general science.

The American Association Meetings bring together scientific and technical men from all parts of the United States and Canada, and the papers presented at the meetings represent a summarizing of the scientific advance for the year. The programs of various societies always contain papers of interest and value to foresters, and more important still, the contacts of foresters with leaders in other professions is a great stimulus to forestry development. The general program of the meeting was full of papers having an important bearing on forestry development. Of these, special mention should be made of the following:

Symposium on Economic Relations of Science Workers, by R. H. True.

Comparative Salary Scales of Trained Men, by Dr. R. H. True.

Dr. True's tabulated comparison of salaries of Federal and State workers with those of industrial research is of interest to all members of our Society.

American Meteorological Society

Eight papers on causes of floods and soil erosion.

Association of American Geographers

The Blackstone Valley of Massachusetts and Rhode Island, a Type Study in Southern New England Landscape, by Preston E. James.

A Geographic Survey of the Greenfield, Massachusetts, area (Physiographical, land utilization, industrial studies and climatology), by faculty members of Clark University.

Land Utilization on Cape Cod, by Robert G. Buzzard.

The Geographic Condition of the Pine Forest Belt of East Texas, by W. T. Chambers and S. F. Austin.

Ecological Society of America

Vegetation of the Northern Great Plains, by H. L. Shantz.

Forest Humus, a problem in Soil Microbiology, by S. A. Waksman.

Mycorhizal Fungi of Forest Soils and their Relation to Tree Growth, by Elias Melin.

The Present Status of the Ecology of the Protozoa of the Soil, by C. E. Skinner.

Bio-Ecology of Forest and Range, by W. P. Taylor and W. G. McGinnies.

The Measurement of Physical Factors as an aid to Silviculture, by G. A. Pearson.

The Quantitative Analyses by Environmental Factors and the future place of Ecology in the Field of Modern Science, by R. N. Chapman.

A number of foresters took part in the program of the Ecological Society. Papers by R. N. Chapman were of exceptional importance. The meteorologists, in co-operation with the geographers, had a most interesting program on the events leading up to the Mississippi flood. The paper by H. H. Bennett on Aspects of Soil Erosion in the Mississippi Basin was of especial note. A talk by Mr. Sherman illustrated with his very instructive charts would have been of great educational value on this program.

Botanical Society of America

Wood and Oleoresin Formation in Turpentine Longleaf Pine as Affected by Spring Forest Fire, by Eloise Gerry.

Traumatic Responses of *Pinus jeffreyi* as Related to the Commercial Production of Heptane, by Eloise Gerry.

Application of Bose's Theory of Sap Rise to Ten Species of Trees, by H. M. Benedict.

Factors in the Frost Resistance of the Leaves of Native Ohio Evergreens.

Mutations in *Pinus sylvestris*, by F. C. Gates.

The Mycorrhizas of Deciduous Trees, by W. B. McDougall.

How Root Systems of Trees are Modified by Competition with Grasses, by J. E. Weaver.

American Phytopathological Society

The Blocking Layer and the Luminosity of the Mycelium of *Armillaria mellea*, by A. H. R. Buller.

Heterothallism in the Rust Fungi, by J. H. Craigie.

American Society of Plant Physiologists

The Reflection of Light from Leaf Surfaces, by C. A. Shull.

Dormancy in the Seeds of *Gymnocladus dioica*, by G. J. Raleigh.

American Society of Naturalists

Relation of Plant Distribution to Temperature, by H. L. Shantz.

American Society of Zoölogists

The Relation of Parasitism to Field Life Conservation, by E. C. O'Roke.

Entomological Society of America

Recent Developments in Federal Plant Quarantine, by L. L. Marlatt.
Developments in the White Pine Blister Rust Situation, by S. B. Detwiler.
Present Status of Gypsy Moth Problem, by A. F. Burgess.
Tree Injection Experiments for Controlling Insects, by W. O. Hollister.
Small Mammals and the Larch Sawfly, by S. A. Graham.

It would be advantageous for the Society of American Foresters to hold their meetings annually with the American Association. When this cannot be done or when there are scientific meetings of similar character at other times and places, it would be well for the Council of the Society to send members as official delegates to see that Forestry has an important place on the program and discussions. A sprinkling of forestry papers on the programs of the societies whose field of work touches any phase of forestry would be highly beneficial to our profession.

The American Association will meet in New York City in 1928, and in Des Moines in 1929. We believe the Society should hold its meetings with the American Association for the Advancement of Science during the next two years. The program committee should be instructed to act early and close the program prior to November 1, so that summaries of all papers will be available by November 15. The chairman of this committee should get in touch with the permanent secretary of the American Association for the Advancement of Science for details as to co-ordination of our program with theirs. The program committee should also be instructed to see that forestry papers are presented before other societies and that foresters are definitely assigned to represent our Society in the discussions on forestry topics before other societies. Joint sessions with the ecologists and geographers could well be arranged for.

G. H. Collingwood represented the Society of American Foresters on the Council of the American Association for the Advancement of Science. The only event of special interest to our Society was the endorsement by the Council of a movement to develop wild life experiment stations on National Parks and Forests.

S. B. DETWILER
G. H. COLLINGWOOD
E. H. FROTHINGHAM

January 11, 1928

MINNESOTA SECTION OUTLINES STATE FORESTRY POLICY

At the request of the Minnesota Reforestation Commission, created by the last legislature to work out a forestry policy for the State, the Minnesota Section was represented at a public hearing held by the Commission in St. Paul on January 24 to January 26. At this hearing Chairman E. G. Cheyney outlined what, in the opinion of the Section, such a policy should provide for and filed with the Commission a brief analyzing the situation and giving the reasons for the suggestions made. This brief was the result of a thorough discussion of the subject by the members of the Section at a meeting held

on January 19 and represents as near as may be the consensus of opinion of the technical foresters of the State.

Briefly the recommendations made were as follows:

I. *Forest Protection:*

1. An ample, trained, year-long ranger force.
2. Adequate funds for fire fighting and the employment of full time guards during the fire season.
3. Education of the public in fire prevention.
4. Legislation providing for the control of blister rust.

II. *An Economic Land Survey:*

III. *Education:*

1. Of the public as to the state's timber situation and the need for forestry practice, through the press, the schools, and by means of lectures, displays, demonstrations, etc.
2. Of technical foresters by building up of a strong forestry school at the University.
3. Provision for research to solve the technical problems of management.

IV. *Forest Management:*

1. Consolidation and enlargement of the State's forest land holdings to include 25 per cent of the forest land of the State.
2. Organization and administration of such lands for continuous lumber production by the Commissioner of Forestry and Fire Prevention.
3. Establishment of a State nursery for the production of planting stock for the reforestation of state lands.
4. Removing the forestry work of the state from politics by placing it under the direction of a continuing non-partisan Forestry Board with power to appoint the Commissioner of Forestry and Fire Prevention and to pass on policies.
5. The enlargement of the Minnesota and Superior National Forests to not exceed 25 per cent of the forest land area of the State.
6. Provision for the exchange of State and Federal lands in the interest of consolidation.
7. Encouragement of town and community forests and the practice of forestry on private lands by:
 - (a) Providing general protection from fire.
 - (b) Co-operation with local protective agencies.
 - (c) Furnishing technical advice as to the proper handling of forest land.
 - (d) Taxation of managed lands on the basis of land value only.
 - (e) Taxation of growing timber at maturity when cut.
 - (f) Distribution of forest planting stock to local and private agencies for reforestation purposes at a reasonable figure.

In closing, the aims of Forest Management were succinctly summed up as follows:

State and Federal:

1. Utilization of idle land.
2. Production of timber.
3. Protection of watersheds.
4. Public recreation.
5. Wild life conservation.
6. Fur production.

Towns and Counties:

1. Protection of local water supply.
2. Production of timber and fuel for local use.
3. Recreation.

Farmers:

1. Utilization of waste land.
2. Prevention of erosion.
3. Production of fuel and timber for home consumption and for sale.

Private Timber Land Owner:

1. Production of forest products for profit.

J. A. MITCHELL, *Secretary*

PROFESSOR HESSELMAN'S IMPRESSIONS OF AMERICA

Experimentalfältet, 27 Oct. 1927

PRESIDENT OF THE SOCIETY:

Having now returned to my own country, I feel very strongly moved to extend to your Society my warmest and most respectful thanks for the interesting and instructive trip which I have had the privilege of making in the United States as the guest of the Society. Thanks to the excellent organization of the journey and the splendid guidance given me in the various places visited, I gained an extremely educative and interesting insight into the forest conditions of North America. The forests of North America differ in many respects from the European and the problems with which foresters are faced out there are in many ways of a different nature from those that confront us over here, but on the whole they are governed by the same natural laws. A tour through the vast forest tracts of North America is therefore of immense interest to a European forester, and I have brought back to Sweden a wealth of valuable experiences.

If my trip has been instructive from a scientific point of view, it has been no less delightful on account of the kindness, hospitality, and good-fellowship which I experienced everywhere at the hands of the American foresters and which have made an ineradicable impression on me.

You may have my assurance, Mr. President, that my tour through the forests of North America in the summer of 1927 will always be one of the most pleasant memories of my life.

Very sincerely yours,

HENRIK HESSELMAN

December 10, 1927

DEAR PROFESSOR HESSELMAN:

It was with great pleasure that I received your letter of October 27. Your visit here proved so helpful to the men with whom you came in contact that it is a real satisfaction to know that it was also worth while from your standpoint.

There can be no question that many of the technical forest problems in the United States and Sweden are fundamentally the same so that an interchange of views and experiences can hardly fail to be mutually helpful. We feel particularly fortunate in having been able to avail ourselves of your assistance in the field of forest soils in which you have done such notable work. I feel confident that your visit will help greatly to place our own investigations in this field on a sound basis and hope that the contacts which have been so auspiciously established may be maintained.

It is a great source of satisfaction to us that European foresters and others interested in the growing and utilization of forest products are coming to this country in increasing numbers. During the past year, for example, we have been honored by visits from representatives not only of Sweden but of Finland, Germany, Poland, Rumania, India and South Africa. On the other hand during the past two years a considerable number of American foresters have traveled rather extensively in Europe. Such interchange of personnel cannot fail to be helpful in cementing the bonds of good fellowship and in advancing the profession of forestry.

I am sure that I speak for the foresters of this country generally in reciprocating your expressions of good will and in assuring you that your visit has proved a most helpful stimulus not only to investigators in your particular field but to the profession generally. I hope very much that it may be possible for you to come again in the near future.

With all good wishes, I am

Very sincerely yours,

R. Y. STUART, *President*

BLAZING NEW TRAILS

Research the Thing

BY CHARLES LATHROP PACK

The stock market has furnished numerous demonstrations of the commercial worth of scientific and technical research in chemistry, mechanics and engineering. The United States has virtually succeeded to the rôle once conceded to Germany in the study and exploitation of new industrial discoveries. To mention only a few examples of the advancement of science and inventive research that are reflected in the course of the stock market during the upward climb of securities in the last few years is sufficient. Notable among corporations which are pioneering in the scientific field is du Pont, whose success is a matter of common knowledge. Commercial Solvents represents an enterprise that owes its origin wholly to the discoveries of chemists engaged in commercial and in-

dustrial research. The Packard Motor Car Company has come to the front as a builder of heavy duty airplane motors because of experiments continuously carried on by Packard engineers over a long period of time. The leaders in the combustion engineering field are doing things today which give promise of far reaching betterments in the use of gas and coal. What the electrical machinery builders have been doing for a generation in their branch of industry is being achieved today in numerous other divisions of industry.

Why not more Forestry Research?

INDUSTRIAL FORESTRY?

By A. J. AUDEN

Forester, Fort William Paper Company, Canada

Industrial Forestry has recently been defined as "the employment by an individual or corporate owners in woods operations of methods of silviculture and forest protection that are intended to promote continued growing of forest crops."

This definition appears to emphasize as the sole aim, or at least of primary importance, for individual or corporate enterprise, the growing of timber for profit through silviculture practice.

The insignificant number of cases and favorable locations where such a business could be carried out to show a profit more attractive than that offered by thousands of other business enterprises will provide but a fractional part of the next generation's timber supply. Present day competition in the investment field will direct wealth to the enterprises showing the greatest and most immediate returns, as it always has done, and until economic conditions change to produce the intensive forest management and all inclusive markets now prevailing in Europe, forest production as a business in itself will not find many backers. Indeed, the very character and temperament of the North American people militates against the necessity for painstaking care and loving patience which the European forester bestows upon each individual acre of his forest and which is the only road to success in forestry as an income producer.

But the necessary timber will be grown. It will be grown in a wholesale way as a secondary object—almost a "side-line"—by the great manufacturing industries requiring wood as the raw material for their factories. The motor tire and rubber manufacturers who put down their own rubber plantations requiring seven years to reach a productive stage might be cited as a comparative example indicating such development.

The fundamental and ruling object of an industrial enterprise is the employment of wealth to produce a yearly profit, while maintaining the original capital investment unimpaired.

Here is the niche where Industrial Forestry will find its greatest sphere of usefulness. It can help to protect invested capital dependent on a supply of wood for its value and it can increase yearly profits to the manufacturer by

lowering the cost of wood at the mill by efficient woods administration and farsighted plans for logging and improvement construction.

Activities to "promote continued growing of forest crops" require three essentials:

- (1) An initial investment in land and timber
- (2) Annual investments in taxes, forest treatment and protection
- (3) Permanent ownership

An annual income from the forest itself or from some other branch of the owner's business is also necessary, unless the owner is a wealthy philanthropist or the government, which, it is popularly supposed, can afford to wait.

Only those large chartered companies which are engaged in the *manufacture of wood into its finished marketable form* can profitably undertake the practice of industrial forestry at present. The chief business of such companies is the manufacture of raw material into saleable products, their chief investment is in mills and machinery for doing this and their annual profit is contingent upon a continual supply of wood. The actual cost of this wood will not, in the long run, materially affect the manufacturers' profits, merely increasing or decreasing the selling price of the finished article.

The wood manufacturing industries are faced with an approaching shortage of the supply of local grown wood. They must either suffer a loss of annual income and salvage what they can of invested capital, or they must grow their own wood supplies.

A chartered company, engaged primarily in manufacturing finished goods, is admirably suited to take up the business of growing wood. Its lifetime is measured by economic, not physical, standards, it controls the concentrated wealth of many individuals, its manufacturing activities provide an annual income and it can operate with reduced or postponed profits for many years until the full benefit of its investments in forest production accrues. So long as it is still a "going concern," it can afford to plough back some of the annual profit from the manufacturing end of the business in the form of investments in forest production which will eventually prove profitable by decreasing the cost of raw material.

In the meantime, supposing that the forest properties that are acquired for forest production do not contain sufficient mature timber to tide the mills over until sustained yield is achieved, the wood-using industries will draw on world-wide markets for their wood at materially increased prices. The extra cost of growing their own timber and having to go great distances for their wood supplies will be borne largely by the consumer of the finished article, since the industry must operate at a profit. Thus, in the long run, the public—who always do get "soaked" for the sins and omissions of their forebears—will pay for this Industrial Forestry.

The field of Industrial Forestry, that is, employment with large manufacturing industries which have decided to grow their own wood supplies, is the largest, most useful, attractive and profitable one which a forester can enter to-day. It is a competitive field and one where a knowledge of pure scientific forestry, however extensive, is not enough, since results and intended develop-

ments are judged and supervised by the keenest business men in the country—men who use the dollar as their yard-stick for achievement.

To one intending to enter this field, a university course in Forestry is a good beginning. But it is only a beginning. Perhaps the greatest boon that any university training gives, is not so much the actual concrete facts and knowledge that one imbibes, as the ability to study, to think rightly, to concentrate on problems and bore into them until every detail and difficulty has been smoothed out.

The graduate forester, starting employment with an industrial company, must study first of all the industry in general in which he is working, its markets, its future, and the significant trends of development that are taking place. Then he must study his own company, its financial structure and investment policies, its mechanical and chemical engineering problems, its transportation, labor and marketing problems and many others. Through all this he will gradually evolve in his mind the *kind* of forestry that his company requires—the general policy to be outlined. Then he must go into the woods, right into the heart of the logging operations and familiarize himself with every detail of the work, adding or rejecting ideas for his forest policy as their practicability is proved when applied to individual conditions as he finds them.

Not until all this has been done, can he present to his Directors a suggested policy or possibly several alternative policies for the practice of Industrial Forestry, any one of which must be feasible, adapted to the needs of his particular company, and which must show attractive profits eventually if not immediately.

It may be that sustained yield is out of the question, that regeneration and silvicultural treatment are alike too expensive for the narrow margin of profit and lack of investment funds that the company is able to show. But anything at all which helps to conserve the Nation's timber supply, even if it is only increased utilization and lower logging costs, which provide indirectly funds for protection and forest maintenance, comes within the field of Industrial Forestry.

Every true forester wants to see our timberlands get a square deal and proper treatment. He will accomplish this most quickly, not by forcing his own views of forestry practice on the nation at large, but by lining up with the great wood-using industrial organizations, studying their needs and limitations, and applying his own knowledge of the art of forest production to assist in overcoming the difficulties now facing the wood-using industry.

IS FOREST PROTECTION TAUGHT IN OUR FOREST SCHOOLS?

A Suggestion

By C. S. COWAN

Chief Fire Warden, Washington Forest Fire Association

At the meeting in Berkeley, December 15, 1927, it was suggested that perhaps much good would follow practical suggestions by alumni of the various Forest Schools as to the curriculum taught to the Forest School undergraduates.

Much was said, but it appeared to the writer that the Deans of the Forestry Faculties were tendered but little strength in the fare suggested. It is true that there was a liberal allowance of spices in the dish offered, but spices do not make a meal.

Perhaps we missed Dr. Raphael Zon at this meeting; certainly some electrifying force was needed to send the potential current over the wires.

At the risk of being thought a crank on one special subject, the writer again recommends to the Forest Schools the necessity for teaching the general fundamentals of Forest Protection.

There are fundamentals, or the work of such men as W. B. Osborne, Jr., Thornton T. Munger, Gael Simson, H. T. Gisborne, S. B. Show and E. I. Kotok have gone for nothing. Here in the Northwest the experimental work of these men is being utilized in every day practice, and what is more, with constantly and increasing beneficial results.

Let us look at the situation.

It has been stated, probably since the first National Forest was established, that Forest Policy could not advance faster than Public Sentiment. Suppose we partially agree with this, and add the fact that the public can be educated as that Forest Sentiment is developed, somewhat faster than would ordinarily be considered normal as forest facts become more generally public property.

The campaign in favor of greater forest fire prevention has borne fruit; witness the Clarke-McNary Act, the interest in American Forest Week. Fire is spectacular, it draws attention from the headline writers. The result is that the attitude of the general public is undergoing a change from apathy to interest, and it is here that there is an advance in Public Sentiment.

But there is still another reason for Public Interest in Fire Prevention, and that is the old law of economics.

It has been stated that the Northwest has from 500 to 750 millions of dollars invested in timber and its allied industries. The preservation of industries of such financial importance means something to the Pacific Coast.

The beneficial results of Forest Protection can be seen on every hand in the Northwest; large areas are carrying second growth crops, which will be marketed, and marketed profitably within the next decade or two. It is such physical illustrations that have led the timber operator to place credence in the statements of those foresters who have been for years preaching the gospel of sustained yield, or for expediency's sake, second crop. It is helping to establish the profession of forestry.

The Insurance Companies have been backward in research work in Forest Protection, and until 1927, the system of insurance was unprofitable as well as unjust to Insurance Companies and the careful and conscientious logger. The investment of between a half or three-quarters of a billion dollars would indicate that there was a market for insurance which could be developed in exactly the same way as the grain elevator and cotton mill insurance market was developed.

It is not so long since both of these plants were not looked upon as a good risk; they were "losers" from the Insurance Companies' point of view. Research into the causes of fires and explosion of both grain and cotton plants was speedily followed by preventive measures being put into effect, and by a

decrease in the losses as well as in rates, as soon as the results began to show.

It is believed that research into the means of preventing logging operation fires will return substantial dividends, and it is to be hoped that the gentle stirring of the slumbering insurance companies forecast a general awakening to the problem.

We have dealt in a most effective way with one aspect of Forest Protection; students are now specializing in Forest Entomology and Pathology—we see the results of this course showing in the excellent work of Blister Rust and Pine Beetle eradication forces.

It has been said that this side of Forest Protection has received notice from the Forest Schools because it followed scientific lines, while fire fighting was a matter of practical experience, in which the schools could not help.

Any move that is made to cut down fire losses achieves the same result as the eradication of Blister Rust—the saving of timber. If the schools cannot help, then it is an indictment of their policy.

Forest School graduates, entering Federal or State Services, will find that, as a general rule, they are called upon to do field work which in the summer season too often means fire prevention and control work. What training have they received for the work which will involve the expenditure of thousands of dollars—for work in which a lack of training or experience might conceivably result in the loss of millions of feet of timber? It also appears to be a fact that there is a leaning towards judgment as to a man's ability on the record he makes on his first year's handling of the fire problem. Thus his future may, too often, be marred by mistakes in fire control work for which he received but little training.

Undoubtedly the Forest Schools can include a Forest Fire Prevention and Control course, with profit to both themselves, their students, and the industry.

ERRATA

In the February issue of the JOURNAL please note the following corrections:

Page 235, line 16 from bottom read, "Melin, E." for "Melin, F."; read "Svenska Skogsvårdsföreningens Tidskrift," for "Svenska Skog-Vårdsföreningens Tidskrift"; also note that twice in the review the reference is made that this contribution to Science is the result of Norwegian investigators. This is erroneous. The investigation is entirely Swedish, two of the co-authors being professors and the third a Docent at the Royal Forest Academy in Stockholm.

Page 245, line 13 from bottom, read "Emanuel Fritz" for "Emanuel Kritz."

SOCIETY AFFAIRS

ZON RETIRES AS EDITOR OF THE JOURNAL

To Members of the Executive Council.

FRIENDS:

In accordance with the provision of the constitution of our Society, the Executive Council must soon select an Editor-in-Chief for the ensuing year. I wish to state, therefore, at this time that I decline, unequivocally and without mental reservations, to be considered further a candidate for the position.

This is not a sudden decision made on the spur of the moment. Nor is it prompted by any untoward act on the part of the Council or loss of faith in my co-workers. On the contrary, one of the things that I treasure most is the confidence which the Society placed in me year after year in the discharge of a task which it always seemed to me was of particular importance to the influence and the prestige of the profession. This decision has been growing on me for several years.

The reasons for this decision, briefly, are these:

1. I have been connected with the American periodic forest literature since its inception in 1902, first as a member of the editorial staff of the *Forestry Quarterly* under Dr. B. E. Fernow; then, as the editor of the *Proceedings of the Society of American Foresters*, in 1905; and later, as the editor of the amalgamated *Forestry Quarterly* and *Proceedings*—the JOURNAL OF FORESTRY—until the present. However small the influence of an editor may be in shaping the professional thought, such influence should not be exerted by one person for too long a time, and 25 years is certainly long enough for any man. The Society has had enough of me. And I consider it an act of wisdom for anyone in public life to know just when to get off the stage. It is always better to go out a little too soon than too late.

2. The time is opportune for such a change. With the increased dues and the growing opulence of the Society, there is no need any longer for a self-sacrificing editor. So far, the editor's job, especially in the earlier years, has not been so much to edit the contributions to the JOURNAL as to keep the JOURNAL alive and going. Editing was the least of his worries. It meant preparing manuscripts for the printer, haggling with the printer for a cheap price, reading galley and page proof, watching for the distribution and the mailing list, soliciting ads, looking after reprints, and all that goes with the publication of a magazine; this often, especially in the years gone by, in the face of apathy and lack of appreciation of technical articles on the part of the majority of members and, because of our youth, dearth of worth-while articles. It is no secret that, if not for the liberality of the Forest Service which was willing to overlook the time given by the editor to the handling of the JOURNAL, the Society could

not have afforded with the resources then at its disposal to maintain the type of technical journal which it has been bringing out since 1905.

Conditions have now changed. The entire routine of printing can now be unloaded upon the shoulders of the paid executive secretary and his paid clerical assistants. The new editor can assume the only task that the editor should have, that of stimulating and passing on contributions to the JOURNAL. A few years ago, if I had quit the job, I would have felt that I was deserting a post of duty. Now, I don't have this feeling, as the Society can afford to pay for such services.

3. The Society has grown and needs a greater freedom of democratic participation in the guidance of the JOURNAL. At the time when the profession was not entirely firm on its intellectual feet, the editor at times had to act as a schoolmaster and use fairly highhanded methods in making decisions. This was necessary at times when either the prestige or the fortune of the JOURNAL was at stake. The child has now grown into manhood. From now on, it should exercise its own independence of thought and shape its own destiny. The old type of editor—and I am afraid I belong to it—is now out of place, and therefore he is glad to quit the stage.

4. And, last, a personal reason. I am either growing older or my work is becoming heavier. Whatever it may be, I do not feel that I am accomplishing as much as I did in the past. It is, therefore, merely an act of wisdom to cut out some of my activities, and at this juncture it seems to me that the Society can best of all dispense with my services.

I shall never lose, of course, my interest in the JOURNAL and shall watch with profound eagerness over its fortunes, just as a parent watches his child that is coming out into the world.

What more can I say?

I look upon the JOURNAL as the spiritual heir to the *Forestry Quarterly*. As I am writing this, I am facing the 36 bound volumes of the *Forestry Quarterly*, the *Proceedings*, and the JOURNAL. No other set of publications represents a better record of the intellectual growth of our profession than these volumes.

In them are also bound some literary traditions. Of these, at least two I hope may be preserved forever: Unflinching adherence to the principles of free expression and free criticism. No creed, however extreme, no theory, however radical, should be barred from the pages of the JOURNAL just because of the ideas expounded. Free criticism of the most established and sacred tenets of our profession should be maintained. And no editor, whether he is a school man or a Forest Service man, should ever use the JOURNAL for his personal glorification or the glorification of the institution to which he belongs, but always maintain it as an independent, common forum for the entire Society.

I realize that it may be embarrassing for me to quit immediately without possibly causing delay in the regular appearance of the JOURNAL. I shall be glad therefore, if it may please the Council, to stay on the job until the May issue is brought out. There is an interval of four months between the May and the October issues. This is also the end of our contract with the printer.

It will, therefore, afford the Council time to make the necessary adjustment and the new editor to take hold of the JOURNAL.

Very sincerely yours,

RAPHAEL ZON

Editor-in-Chief

HAS THE SOCIETY OF AMERICAN FORESTERS A SOUND MEMBERSHIP POLICY?

Now that our Society is trying to determine why it is not functioning in a satisfactory manner, perhaps a little consideration of its membership policy may shed some light on weaknesses we all want to see corrected.

It is the feeling of the writer that its membership policy resembles too closely that of an exclusive club. As a professional society, our Society should seemingly be open to all members of the profession in good standing. Yet the question arises, "Is it?" It is quite easy to determine whether a man is or is not a forester. It is settled either by his having graduated from an accredited forest school and being actually in forestry work or having come up from the ranks of rangers and others to the point of doing technical forest work. Yet, as a matter of fact, a man does not become a member of the Society by simply showing that he is a professional forester. He must submit his name for election after first being invited, not to join, but to state his qualifications. This savors very much of lodge or fraternity procedure. The right to elect carries with it the right to reject, and many men, realizing this, hesitate to offer their names for acceptance or rejection to a society to which they feel they have a right to join without challenge by virtue of being in the profession.

It is true that at the moment, the Society is desirous of increasing its membership and is pretty largely canvassing the field to take in all members of the profession, but this has not always been the case. There was a time when many foresters in good standing were not considered as eligible. Under the present constitution, there is no reason why the Executive Council could not (despite membership qualifications laid down in the organic act) exclude many members of the profession. Is it not possible that a few older members, disliking to see too many youngsters about, may again close the door—particularly if our financial difficulties are solved? Would it not be a good thing for us to remove the elective qualification and to admit automatically all bona fide foresters who apply?

It seems to me that perhaps an even more serious defect in our organization is the grading of membership into ordinary membership and senior membership classes. What is a Senior Membership? Is it a full professional certificate or is it a minor honor? It is supposedly determined by the quality of a man's work in his profession, yet it does not rest upon any easily definable or determinable standard of performance, nor on any spontaneous recognition of exceptional merit, as in the case with Fellows. It rests on the opinions of a small group of men who by virtue of being officers of the Society are asked (and no one envies them the job) to do the impossible: namely, to

grade men as to achievement. That these men take their responsibility seriously is no defense of the system. The harder they try to split hairs to do the job well, the worse they are going to fail. Every time a new member of the Executive Council is elected, a new qualification for senior membership is more or less unconsciously set up. If it is less severe, the new promotions are unjustly made as compared with earlier ones. If the standards are unconsciously raised, the existing senior members were unjustly promoted. That in most cases selections for promotion are as fair as human nature permits, is undoubtedly true. Yet no one will deny that injustice occasionally happens. Who can say how often?

Consider for a moment the case of those rejected for promotion. They will be in two classes, dullards and non-conformists. If it were only the dullards, even with the inevitable injustice to those who are wrongly classed as such, it might not be so bad; but it must not be forgotten that the non-conformist seldom impresses his fellows with his wisdom, yet sometimes he knows more than the rest of us. Progress comes as often from the man who declares his elders to be all wrong as from him who follows in their footsteps dutifully. The non-conformist is apt to be regarded as theoretical, visionary, or "unsound." He is not invited to sit with his elders and, having been denied admission, he sometimes goes away to upset all the ancient gods. Then the elders must make peace with him on his own terms, if he will let them. Learned societies have more than once denied admission to a young fellow with revolutionary ideas who has later arrived on the summits after climbing on over a trail of his own. Secure in his own position, he has then proceeded to thumb his nose at the savants of the older days.

Some years ago, a young French chemist was busy publishing papers about radio active substances and implying that after all there were no immutable elements. The French Academy would have none of him. Today, Pierre Curie, the discoverer of radium and revolutionizer of chemical science, is greater than them all, and the Academy tries to forget the incident. Suppose a young foreigner began publishing articles on how to produce 100-foot pines on ten-year rotations or to successfully change the character of wood in the living tree, would he be elected to senior membership?* Well, suppose he made good, who would the joke be on?

Aside from the unfairness of elections to senior membership which is inherent in the system, it seems to the writer a distinct weakness to the Society in the conduct of its affairs. It is presumably intended to strengthen it by concentrating office holding power and prestige in older men. Assuming for the moment that this is a good thing, does it not destroy equally valuable initiative and enthusiasm in the younger ones? How many junior members take our Society and its aims seriously or think much about its affairs when they are denied full participation in them? My own experience would lead me to think that they are inclined either to resent the undemocratic arrangement or to sniff tolerantly at the pretensions of their elders.

Although perhaps no longer a young man, I wonder if the leadership of the elders is sufficient or if a little initiative from their juniors would not help

* He would not.

our Society. It is on record, I believe, that on one occasion, the juniors voted to raise the dues to support a full-time secretary when their seniors could not see that it was necessary.

At the present time no one is satisfied with the way the Society is functioning. Why not try a change in membership policy and abolish all distinction between Members and Senior Members. Let each man in the Society have the same rights and privileges and see if we don't get more interest in its affairs all around. Younger men are not likely to run away with the Society unless their views prove intrinsically sound. At least the members of the Council would have more time to devote to its constructive affairs if they did not have to spend hours in trying to do the humanly impossible stunt of justly grading men into arbitrary classes as to their professional achievements.

Another matter in connection with membership elections and promotions which seems to the writer unsatisfactory, is the practice (at least it is the one used in some sections) of sending a man a blank to fill out stating his own qualifications. Whether he has previously been nominated for membership or promotion or not, he is thus put in the embarrassing position of being obliged to seek his own election or promotion by making the best case he can for himself. Not only is the procedure undignified, but it places the man who is aware of all he has not done, as compared with what he would like to have done, at a disadvantage as compared with the man who is too well satisfied with his own achievements. In case a man who has been through this procedure is turned down, he is going to feel that he has been unjustly treated and to be suspicious of the entire system. His reactions in dealings with the Society are easy to imagine.

If we are to have what seems to me to be the essentially unsound system of elections and graded membership in our Society in place of a democratic system of membership based on simply membership in the profession, all having the same rights and privileges, would it not be more honest and honorable, and less likely to cause embarrassment, not to consult men who are considered for election or promotion at all, but merely to inform them that favorable action has been taken.

The present requirement that Associate Members be admitted by election is sound, as it is not reasonable to throw open the doors of a professional society to non-members of the profession. This grade of membership is, as we understand, intended to take care of men who are doing work connected in some way with forestry, but acknowledgedly not foresters. A more liberal policy in regard to admissions to this grade would be of advantage to the profession and the Society, as it would bring to it association with the point of view of forest entomologists, forest disease specialists, landscape architects, park experts, game protection specialists, wood preservation and utilization experts and the like, with whom foresters must work and whose profession overlaps their own and with whose points of view they must reckon, but too seldom understand. It would also introduce by induction the forester's point of view into allied professions where it needs to be better appreciated.

Certainly there can be no objection to electing distinguished foreign foresters to Honorary Membership in our Society, and occasionally one of our own

members will merit the grade of Fellow as an honor bestowed upon him by common consent of his associates, but there is one absurdity in the provision that the society may elect to honorary membership persons from its own group. Is this a device for depriving the elected of a vote in society affairs—a sort of equivalent to promoting an inefficient military officer to a higher rank and retiring him on half pay, the exemption from dues being the equivalent of half pay?*

In summary, therefore, the writer would like to suggest that the Society seriously consider three distinct changes in its membership policy.

(1) To abolish the provision for election to ordinary membership, requiring only that candidates submit evidence that they are professional foresters and, upon substantiating their claim and payment of dues, to automatically become members. The function of the Executive Council would be simply to pass upon the evidence as to whether a man is or is not a forester.

(2) To abolish the grade of Senior Member.

(3) To pursue a more liberal policy in the election of Associate Members.

P. L. BUTTRICK

Secretary Connecticut Forestry Association

215 Church Street
New Haven, Conn.

LIFE MEMBERSHIP IN THE SOCIETY OF AMERICAN FORESTERS

Life membership should be offered by the Society to all its members who wish to do away with the customary bother of annual dues. This would result in a distinct relief to many members and a possible advantage to the Society as a whole. The total of the lump sums paid in, would form a fund most desirable to have at this time when the Society is struggling to overcome its financial inertia. Those who should know, tell us that the recent increase in dues is only a step in the right direction. The logical goal is cash in the treasury to lend specific gravity to the Society's endorsements. Such an end can be reached through offering life memberships.

This is not a form of philanthropy which has served so often to hold the Society up, but a well recognized, practical plan adopted by more progressive societies and foundations. It is possible for our Society also. If one takes the membership register for 1924 and checks off likely names for life-membership, it is quite easy to select some 40 Members and 60 Senior Members, not even including our Fellows nor the membership in our two more opulent Sections and those who have become members since 1924. So these 100 prospects form merely a conservative working figure.

For further figures to play with, one might use the new fee scale now endorsed by the Society, and consider ten years' dues in a lump sum as sufficient for life membership. This would require Members to pay \$60 and Senior Members and Fellows \$80, if they wished to take advantage of this privilege. When a Member is raised to Senior Member and is a life-subscriber

* Honorary Members have no vote nor do they pay dues.

at the time, it would mean his paying \$20 more to continue his life membership status. Such a scheme would roughly make available a fund of at least \$7,200. Such payments are, of course, only suggested at random. A closer scrutiny of life memberships in general should be made.

But today one seldom finds the non-moss-collecting society or foundation rolling along without offering its members freedom from annual dues in the form of a life membership sum. The Society would do well to consider some such plan.

JAMES AVERELL

NOTES ABOUT FORESTERS

R. W. Graeber of Statesville, North Carolina, extension forester, was elected secretary of the North Carolina Forestry Association for 1928. W. J. Damtoft, Forester for the Champion Fibre Company, Canton, is treasurer.

Clifford H. Foster of Good Ground, New York, has been appointed superintendent of the Charles Lathrop Pack Demonstration Forest near Lake George, New York. This forest was recently presented to the New York State College of Forestry and is located three miles north of Warrensburg. Mr. Foster is a graduate of the New York State College and secured his master degree from Harvard University in 1923. He has done some research work in the Harvard Forest at Petersham, Massachusetts.

Grover N. Conzet, State Commissioner of Forestry, is busy supervising the survey of three hundred thousand acres of state timber and cut-over lands under special Act of the Minnesota Legislature. The survey is to include an examination of the soil in the hope to definitely establish whether the land is better suited for agriculture or timber growing. Report will be made to the legislature which meets early in 1929.

Woodbridge Metcalf, Extension Forester at the University of California, has just completed arrangements for two county demonstration forests in Santa Cruz county.

James E. Ryan has been designated supervisor of the Kaniksu National Forest, Newport, Washington.

Roy A. Phillips has reported for his new assignment as supervisor of the Nezperce National Forest with headquarters at Grangeville, Idaho.

J. R. Simmons, secretary of the New York State Forestry Association, Ralph S. Hosmer of the State College of Agriculture, William G. Howard, State Superintendent of Forests, and Dean Franklin Moon of the State Forestry College at Syracuse, were among the witnesses who appeared in behalf of Senator Hewitt's \$100,000,000 bond issue plan to finance reforestation in New York State over a period of twenty years. Two agencies opposing the plan were the State Grange and the New York Industrial Survey Commission, both of whom objected to the bond issue method.

Among the foresters who have appeared before the House Committee on Flood Control in behalf of reforestation as a helpful measure are, E. A. Sherman and Raphael Zon of the Forest Service; Ex-Governor Pinchot of Pennsylvania, and Shirley W. Allen, representing the American Forestry Association.

W. S. Taber, state forester of Delaware, is busy with plans to establish a state forestry nursery from which seedlings will be sold to Delaware land owners. According to Mr. Taber, Delaware is one of the states which depends largely on wood for fuel, outside of Wilmington.

Wallace I. Hutchinson has been on detail in the Washington office of the Forest Service to prepare material for the 1928 observance of American Forest Week.

B. L. Harper, graduate of the University of California, has recently been added to the staff of the Southern Forest Experiment station and assigned to Starke, Florida, as Junior Forester.

Thomas W. Skuce, Extension Forester of West Virginia, assisted at the organization and conduct of a conference of the forestry committee of the West Virginia Kiwanis Clubs at Parkersburg. As a result of this conference, it is planned to have a series of conferences during May, throughout the state, to secure action looking to better state forestry organization.

Carl P. Fatzinger assumed his duties as Assistant State Forester of Delaware on December 1, 1927. Mr. Fatzinger received his training at Mount Alto and for some time previous to his appointment he was employed by the Crossett Lumber Company.

Edmund Secrest, State Forester of Ohio, has succeeded in interesting land owners along Ohio highways to start a number of demonstration forest plantings. He has his state nursery capacity up to about three million trees annually.

Tom Gill is in the American tropics on the first of a series of investigations which will extend over three years. Mr. Gill is now forester of the Charles Lathrop Pack Forestry Trust and makes this investigation under the supervision of the Tropical Plant Research Foundation. He will visit Haiti, Santo Domingo and Venezuela, co-operating with government officials, timberland owners and foresters of various countries in securing information on the stand and availability of tropical hardwoods.

Theodore S. Woolsey, Jr., made a special trip for appraisal of flood danger in the northern part of New Hampshire and is quoted in the November 13 issue of the *New York Times* as believing that federal aid is needed in those regions for new highway construction and reforestation work.

PROFESSOR FRITZ RETURNS TO TEACHING

Emanuel Fritz, Associate Professor of Forestry, has just returned to the University of California from a year of sabbatical leave. Professor Fritz has spent an unusually full year gaining first hand experience in some of the outstanding problems of the lumber industry. Part of his time was spent with the California White and Sugar Pine Manufacturers Association and the remainder with the West Coast Lumber Trade Extension Bureau. In both cases, his official title was that of Wood Technologist. This work took him over most of the United States, giving him a chance to visit all the important lumber markets of the country, besides visiting a number of the forest schools.

While the inducements made to retain him in the trade promotion work were very flattering, he has returned to the teaching of wood technology and

lumber because of his liking for this kind of work and his belief that a greater service to the lumber industry can be fulfilled through helping to train men with a proper appreciation of the balance between forestry, engineering and economics.

SOCIETY REPRESENTED ON LEGISLATIVE COMMITTEE

The National Committee on Conservation Legislation, which was organized in December, 1926, held its second annual meeting on December 14, 1927, at which the Society was officially represented by R. Y. Stuart. Other foresters attending the meeting were: Arthur Ringland, Barrington Moore and Ovid M. Butler. The Washington subcommittee was continued and consists of representatives of the American Engineering Council, the National Parks Association, National Conference on Outdoor Recreation, the American Forestry Association, and the National Lumber Manufacturers' Association. Members of the committee are co-operating particularly with an informal group of agricultural organizations to emphasize the need of fundamental research in the Department of Agriculture. Unusual interest in the forest research items have been shown by the National Grange and the American Farm Bureau Federation.

NORTHERN ROCKY MOUNTAIN SECTION PLANS REGIONAL MEETINGS

With the idea of securing fuller participation among the members, meetings are planned during the winter by the Northern Rocky Mountain Section in Moscow, Idaho, and Spokane, Washington, as well as in Missoula. An enthusiastic meeting on January 9 at Missoula opened with a review of the San Francisco meeting by Theodore Shoemaker. Report of the Conference of Forest Schools was made by Tom Spalding and "A Trip to the Redwoods," was given by E. L. Koch. Comments followed by Fred Morrell and H. T. Gisborne.

Among interesting subjects planned for further meetings are "A Forester's Ideas on Mississippi Flood Control," by M. H. Wolff, and "An Engineer's Ideas on Mississippi Flood Control," by Fred Miner; also, "Size and Defect in Western Pines," by M. Bradner, and "Getting the Most Out of Inferior Species," by P. Neff. On March 5, T. Lommasson will discuss "Are We On the Wrong Track in Our Grazing Management?"

AMERICAN FOREST WEEK

Perhaps the members of the Society do not know that the continued observance of American Forest Week was almost cut short at the first meeting of the National Committee held November 11, 1927. There was a feeling by some of the members that it has out-lived its usefulness, but it was finally decided that the value of the President's proclamation alone was sufficient to attempt further conduct of American Forest Week activities. Under the leadership of O. M. Butler, as chairman of the executive committee, replacing R. S. Kellogg, resigned, state chairmen have been appointed in most of the states. The executive committee and board of directors decided that it should be easy for each participating organization to contribute at least \$25 to the work of the national committee as benevolent of its good faith in assuming responsi-

bility in being listed as an interested organization. It has also been thought that each state participating should raise \$100.

Correspondence indicates that no region of the country wanted the observance of the work discontinued, and contributions are coming in slowly. There is a fine opportunity for the sections of the Society and for individual members to mark the week by special contribution to local newspapers and by serving on local committees.

DR. SCHENCK'S EUROPEAN FORESTRY TOUR

Sailing for Europe on the S. S. *New-Amsterdam*, of the Holland-America Line from Hoboken on March 17, 1928, I desire to take with me a small bunch of men—men only—to be guided by me through the woods of Holland, Switzerland, France, England, etc., etc.

We shall visit, under the pilotage of their supervisors, some forests which have played a typical rôle in the annals of forestry; and we shall also see a multitude of failures.

We shall see the conditions under which sustained forestry is possible; and also the circumstances which lead to "brush-forestry," inescapably and forever. We shall study the revenues possibly from forestry, and hence the possibility of "industrial forestry" under varying conditions.

We shall study the silviculture of the various sections, ever-changing, ever-experimenting, never certain of its results.

We shall study the utilization of the woods, too.

From April on and for a couple of weeks, a dozen Oxford students will join our party. The party will return to New York on the same boat (*New-Amsterdam*) by May 20, thus the tour will take two months. The total expense, including the ocean fare, will be \$550 per capita. The trip is a spring trip because at that time there may be seen silviculture as well as logging; because at that time the hotel rates as well as the steamer rates are the cheapest.

My friend Dr. E. A. Ziegler, director of the Pennsylvania Forest School at Mont Alto, Pennsylvania, is kindly arranging for passports and for steamer accommodations while I myself am engaged in a flying trip through the western states. Applications for participations should be addressed to Dr. Ziegler.

No one should apply who is neither lumberman nor forester; young and old are welcome provided that they are deeply interested in object lessons increasing their vision as to the possibilities and also as to the limitation of forestry.

Truly yours,
C. A. SCHENCK

PROCEEDINGS OF THE WORLD FORESTRY CONGRESS

Plans of the International Institute of Agriculture for the publication of the proceedings of the World Forestry Congress at Rome, April 29 to May 5, 1926, were announced in the October, 1926, JOURNAL OF FORESTRY. The Institute now announces that four volumes of 750 pages each, with about 300 photo-

graphs and diagrams, containing the reports submitted to the Congress, are ready for distribution. The fifth volume containing the reports of the various meetings, the resolutions adopted, etc., is in preparation and will be distributed as soon as possible. The accounts of the meetings are in French while the various contributed articles are published in the language in which they were submitted.

Prices for the entire set of five volumes are 175 lire to members and associate members of the Congress and 300 lire to others. Orders may be placed either with the editor of the JOURNAL OF FORESTRY or sent direct to the publication's office, International Institute of Agriculture, Villa Umberto I, Rome, Italy.

S. T. DANA
*Chairman, Committee on
International Relations in Forestry*

ATTENTION

SOCIETY PUBLICATIONS WANTED

It will be appreciated by the Council if members having back numbers of the Society publications listed below and willing to part with them will send them to the Secretary of the Society. A price of fifty cents will be paid for each copy of the following numbers:

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Vol. 21—No. 5 & 6	Vol. 12—No. 1	
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Vol. 24—No. 3, 4, 5 & 7		
Vol. 25—No. 1		

Send to:

WARD SHEPARD, *Secretary*
Society of American Foresters
Atlantic Building
Washington, D.C.

GULF STATES SECTION MEETS

A meeting of the Gulf States Section was held on December 30 at New Orleans, and the following officers were elected:

E. L. Demmon	Chairman
Roy L. Hogue	Vice-Chairman
N. D. Canterbury	Secretary and Treasurer

A Committee consisting of W. R. Hine, Roy L. Hogue, E. O. Siecke was appointed to pass on memberships.

The following men attended the meeting:

C. F. Evans	J. K. Johnson
E. L. Demmon	James Boyd
W. R. Hine	G. H. Lentz
N. D. Canterbury	V. H. Sonderegger
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FOREST FINANCE By Hermon H. Chapman, Prof. Forest Management,
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